Design as a Thing

How Designers Make Up Design as an Object in Human-centred Design Practices

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ABSTRACT

Designers working with the human experience of digital technology encounter a gap between the representations of design as a methodology of human-centred innovation and their everyday negotiations around collaboration, design implementations, and the centring of users in this work, which rarely go according to plan. This gap indicates the need to open up the black box of human-centred design, to illuminate the relationship between the idea of design and the situated activity of design. Therefore, this research investigates human-centred design as an object which is made up in practice. A sociomaterial practice lens as an analytical framework reveals the reproduction of design as a thing which is actively made and re-made in everyday design practice, illuminating the contingency and fluidity of its existence, as well as the involvement of human and nonhuman participants.

The analysis shows the sociomaterial relationships of design practices through a narrative separation of the three strands: (i) the objects, (ii) the subjects, and (iii) the enactment of design. The methodological framework follows Gherardi, and in further detail Suchman, Mol, Haraway, and others, illuminating the contingent and ongoing negotiation around the bounding of relations into objects and subjects of design. The research was conducted with interaction designers who work in digital innovation in the United Kingdom. Ethnographic observations and interviews, job adverts, and literature have shed light on how designers engage in the making up and enacting of human-centred design.

By representing design as a human-centred process for mediating different kinds of knowing – such as intuitive and logical, subjective and objective, individual and collective – design is positioned as the better alternative to traditional top-down and engineering-led organisational practices. Through opening up production practices as *innovation games*, designers renegotiate the orders and positions of people, things and their knowledges, within production processes by locating knowledge entities. In the course of this locating of knowledges, *implementation* is isolated as a separate entity belonging to *engineers* over which designers try to enforce their descriptions of technology. Designers do so by taking up the flexible position of being in between knowledge locations, and relating these knowledge locations in synthesis. Through claiming these positions of domination in the name of the user, design practices work to separate the human and technology. On the subject level, the

designers are entangled with the object of practice, and it is through design as an object that designerly knowing is enacted as a special kind of knowing which is difficult to access for anyone else.

This thesis argues that design as an object effects a simultaneous splitting and synthesising of the human and the technology for the purpose of reshuffling the orders and positions of people, things and their knowledges within organizational practices. Designers reconfigure these orders and positions by simultaneously locating knowledge entities and synthesising them by being their mediator. Currently, representations of design work to obscure this function of design. Opening up the black box of human-centred design through the use of a sociomaterial practice lens illuminates the contingent makeup of design and its effects.

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ABBREVIATIONS

UX user experience

UI user interface

UCD user-centred design

HCI human-computer interaction

IA information architecture

AI artificial intelligence

IoT internet of things

API application programming interface

STS science and technology studies

ANT actor-network theory

NDA non-disclosure agreement

SPECIAL TERMS

Bug: a fault in the software, something working in unexpected ways.

px: the abbreviation of *pixel*, which is the smallest unit a screen can display.

Work-around: achieve the same function with different means.

Code base: the computer source code of which an application is built.

Code freeze: an agreement to hold off on making changes to a part of the code base.

Developer: short for software developer, a person who builds/codes software.

Opt-in/Opt-out: To *opt in* to something means to agree to be part of it. To *opt out* of something means to not agree to be part of it. In the context of this thesis, it refers to questions in forms which would categorise respondents to be either a part of a pool of people or not.

Go live: with software, to *go live* means that that code is released to its users and customers.

Mockups: In the context of human-centred design in digital innovation these are drawings of user interfaces or user interface components. They are typically made in varying levels of fidelity during different stages of design, for example detailed mockups are high fidelity drawings, while low fidelity mockups are rough sketches of the user interface.

Wireframes: schematic drawings of a web or mobile application, which typically include a sense of the functionality and the navigation structure of the application.

Brainstorms: group engagements for producing ideas.

Top-down: the understanding that in organisations traditionally managers sit *higher up* the hierarchy and are therefore able to give orders from the *top down*.

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1 INTRODUCTION

I am a designer. My concern is that *design* has become a tool for change and innovation, when in itself I have never seen design work very well, or very reliably as such a tool. I am not sure if design can do what it says it can. In this introduction, I am going to explain my concerns and will speak about my personal experience, which has been the trigger for this Ph.D. Before I go on further, I will explain what and who I talk about when I say *design*.

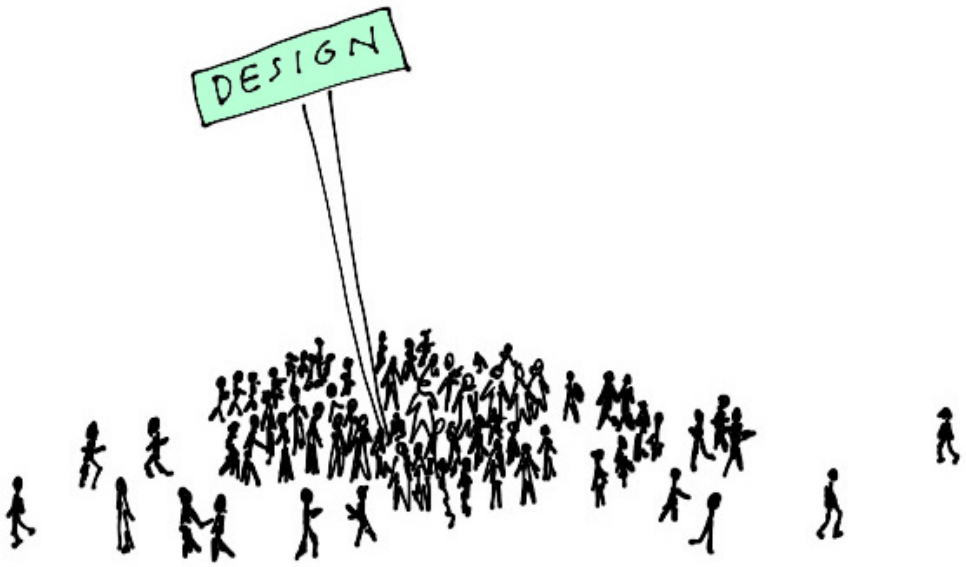


Figure 1: The designer community as a fluctuating, busy, buzzing meeting point

1.1 WHAT I MEAN BY DESIGN

By *design* I mean the community made up of design practitioners working for organisations, designers' professional bodies, design educators at universities and other institutions teaching and training design practitioners, and design scholars theorising about what design is, how design works, and what design is for. Designers earn design degrees, attend training courses, and hang out with other designers at work and in their homes. Designers read books; write books; research design; write academic papers; discuss design at academic conferences and in research seminars. All of these

activities influence each other and together make up one community of design. Design is made up of many disciplines, as Margolin (2013) lists, "product design, graphic design, fashion design, transportation design, interior design, design management, and the related activities of engineering and architecture, we have service design, interaction design, human–computer interface design, universal design, participatory design, ecological design, social design, feminist design, medical design, organization design" (p. 403). There are epistemological concerns about how design practice can be conceptualised for the purpose of education (Findeli, 2001; Margolin, 2007). Design is an interdisciplinary community, and many designers cross over – temporarily or permanently – from other disciplines such as engineering, psychology, business management, sociology, cultural studies, etc. When I say *the designer community*, I mean a constantly fluctuating, busy, buzzing meeting point of everyone who has something to do and say about design (see Figure 1).

I will make this group of design-doers-and-sayers significantly smaller by looking at the context of innovating digital technology. Design is here often called *human-centred design*. These are all designers who have something to do or say about the design of products and services built through the web, mobile, and smart technologies. These products and services are provided through the internet (e.g., online media, retail, or governmental services), as well as electronic interfaces such as mobile phone applications (e.g., communication, entertainment), or smart technology (e.g., energy, heating, TV, vehicles) resembling a new internet of things (IoT). This is my field of study, which I call *digital innovation*. Here the crossover to engineering is great. I only include designers working on the human-centred concerns of these digital technologies, and not, for example, those designing software systems, databases, or artificial intelligence (AI) algorithms. The community of human-computer interaction (HCI) is strongly represented in this research as the core cluster of people who deal with human-centred design in innovation, but so are also other clusters within the community, such as industrial design, product design, graphic design, communication design, social design, and service design. The designers in HCI and its vicinity have many different job titles. They are user experience (UX) designers, UX architects, user interface (UI) designers, UI engineers, interaction designers, (digital) product designers, information architects (IA). It is a large range of roles which I refer to when I say *designer* or *interaction designer*. I will continue to call this particular fuzzy cluster of designers concerned with human-centred design of digital technology, the *design community* – these are the people I mean when I say the *designers*.

Design has strong roots in art (Margolin, 2013), and as the discourse in the digital innovation industry is grounded in engineering, design has an awkward position in this field (Fallman, 2007). Design, with its artistic tradition, seems to clash a little with this science-oriented environment. Designers, therefore, experience in this field the unique pressures of sitting between the two dissimilar traditions of art on the one hand and science on the other. Notwithstanding, the U.K. design community has an influential role in innovation as an economic area (Design Council, 2015a) and with its multifaceted position spanning across art and science, it aims to synthesise human needs and technological possibilities (Youngs, 2014). Through this multifaceted situation, design in digital innovation sits in a very interesting location, where its tension bears the potential of resolving this seemingly incongruous dichotomy, discussed in more detail in section 3.1.1.

As it has become visible in this initial staking out of the boundaries of what I mean by *design*, *designer*, and *digital innovation*, these are very fluid objects, subjects, and environments of work which are, in my view, not possible to capture and outline as distinct entities. Not only are these entities in flux, but they are also negotiated by their participants. It is, therefore, that I insist on the general term *design*, which will emerge as a distinct thing in the context of this thesis and the research I have conducted. I may also call it *human-centred design*, in line with how it is often called in the field. I am also one of the participants involved in making up *design* in *digital innovation*, both as a designer in the field and as a researcher of design practice. In this thesis, I will work to convey what I mean by *design* – what it is for me, and what it is for the other designers I worked with in this research.

1.2 MY EXPERIENCE AS A DESIGNER

I will continue now with the introduction of my personal experience as a designer. I have been working in digital innovation, and design seems to be treated as a methodology which is, by its nature, capable of producing innovative products and services. At one point, I was working in an organisation where managers had training in *design thinking*. Before that, I had worked in an organisation where *design* was a process adopted as a form of managing projects collaboratively. From my vantage point, *design as a process* was a particular *designerly way of thinking/knowing* which designers had *donated* to teams as a creative and collaborative framework for innovating. But as a designer, I have been grappling with this idea, what it really means. Completely aside from the

question of the *export* or *donation* of my ways of working as a kind of *design thinking*, I have actually not seen my ways of working as particularly *successful* (not the exported version either, by the way). And this is not because I doubt my abilities and skills as a designer, or someone else's, but because I have come to doubt the claim that the *designerly way of thinking/knowing* is what it says it is, and that it can do what it claims to be able to do. I have not seen *innovative* solutions come out of design work. That doesn't mean that design work produced dull or useless solutions. But how is *innovative* defined? There are lots of anecdotes, but very few empirical studies on the "power" of design and its value to innovation (Hassi & Laakso, 2011). Besides, even if a designed solution could be measured as *innovative*, I could not claim I have seen a particular design outcome which could be directly ascribed to the ways the team applied particular systematic design activities, a particular methodology, or a particular designer who *thought/knew* in special ways. Design work, and how teamwork unfolds, is messy. It is a messy negotiation, with stakeholders, server capacities, legacy systems, personal backgrounds and experiences, how people get on, and managers being accountable for goals not always visible to the rest of the team. In the following text, I will outline briefly the main factors I have experienced as significant in design practice.

First, there is a large difference in the cultures of organisations, sectors, means of income, and the goals which organisations pursue. An organisation providing financial services to large corporations will have a different culture than an organisation serving local government in the implementation of public services. And the provider of a product which has been on the market for twenty years will organise itself differently from a start-up trying to break into a new market it seeks to create for itself. Each of these cultures depend on the wider practices they are embedded in. Also, there are different cultures within organisational departments and what they deal with daily. Accordingly, culture will be different for designers being embedded within the marketing team, within the engineering team, or as a team by themselves. Organisational cultures matter for design work (Kimbell, 2011, 2012; McFall, 2014; T. Miller, 2010, 2014).

Second, it matters what designers do, what roles they fill, what responsibilities they are assigned, and in what capacity they are employed, and this may be vastly different from organisation to organisation. What designers do, depends on what design work is incurred within the organisation, and what *counts* as design work. Accordingly, a designer may be responsible for everything from

graphic design to user interface (UI) design, or from user research to coding UIs. What designers do, also depends on the size of the organisation and the size of the design teams. Mostly, coding user interfaces is a separate role. Often, graphic design is a separate role. And sometimes, user research may be a separate role. Designers in digital innovation typically work on the research of user needs, on the design of UIs, and on the evaluation of designs through user tests (Garrett, 2011; UXPA, 2018). The daily practices, the knowledge involved, and the people to work with will be very different according to the responsibilities which the designer fulfils. Furthermore, some designer contracts are project-based, some projects are for a few months, and some designer contracts are permanent positions within the organisation. Designers may also be part of design consultancies and join organisations either directly or remotely for a set period. The managerial reporting lines will be significantly different in all these situations.

Third, design is a negotiation. Everybody within an organisation has an idea of what will become of the product or feature. CEOs and managers have a vision for their product, as well as the economic pressure to be *right* with their vision. Sales and account managers hear a lot about what people want and don't want, as they close their deals, or don't. Engineers know the product inside out, as they write most of the code a product is made of. They need to deal with the fallout if servers crash and technology breaks. Within their responsibility, they make many decisions that affect what a product will be. Designers feel they need to reign in the engineers with their *outlandish* ideas of how people use technology (Cooper, 2004). In my experience, we designers make the claim that User-centred design (UCD) is the right thing to do, and that we need to base all design decisions on user feedback. While we receive superficial agreement, there are many obstacles to having extensive user contact, beginning from legal grey zones, costs, and the logistical issues of squeezing user-related work into busy development schedules when there is always something more pressing to work on. Design decisions and work priorities end up being hard negotiations, and a lot depends on the negotiation skills of those involved. In this negotiation, everybody is working with the tools they have. Salespeople tell about the big client they are about to get if the tool had just that one feature. Engineers are concerned about the ever-growing, difficult-to-maintain code base, which should ideally be frozen for, say, six months so it can be migrated from the legacy system onto a newer framework. So, they might actively keep opaque what can and cannot be done within the existing system, to protect themselves from requests that mess up the existing mess even further. Nobody else

has enough insight to judge their time estimates. We designers fight with our own tools – make friends with the engineers in the best of cases, or in the worst of cases threaten them with the jurisdiction of user tests – where their technology will be doomed. There are not many people in these organisations who take for granted designers' *natural* ability to facilitate design decisions, as we designers have been taught (Fisher, 1997). And there is nothing we can do apart from honing our team and negotiation skills – if we even have an idea what that means.

Fourth, there is a lack of shared understanding. Even with the best of intentions, our organisational practices make us distant from each other. In one organisation I was curious to find out that some of the issues we designers had newly discovered had been known by the account managers long before, because customers who bought the product kept complaining to them. Or I was amazed to realise that the help-desk officer had developed a number of successfully working work-arounds over the course of time as she was continuously confronted with desperate customers who needed a fix in that very moment because their video livestream was about to start. I also had eureka experiences the other way around, when I asked engineers to explain the knotty technical issue they had been struggling with, when suddenly in the course of laying out the issue to me – a layperson – a solution arose. It made me realise that design work was happening all over the place, in an uncoordinated manner. Everyone had a different understanding of how things were, and how they ought to be, and everyone's understanding had an influence on how things ended up being. I began to be interested in mapping approaches that might centralise these dispersed design efforts into publicly visible maps that could guide product development (Patton, 2014).

Fifth, and finally, the use and implementation of design processes proved controversial. In the various work settings, I have come across a whole range of processes. It is always difficult to agree on a design process. Most designers and engineers I know agree that Waterfall (Dubberly, 2004, p. 68) is a *bad* design process. Even though it allows for user research upfront and is therefore sensitive to User-centred design (UCD), it takes a very long time to complete all stages and release a new product or feature. By the time a new product is released, it is likely out of date, or not needed any more. Development processes which support more rapid development, such as Agile (Wynn & Clarkson, 2018, p. 184) or Lean (Blank, 2013), have other issues for design. In Agile, there is no space for user research, but instead only for building the user interface (UI) with features which have

been decided by the managers of the organisation. The question of whether the feature is the right thing to build never comes up within the team, only the question of how to build the thing. As designers, we are interested in building *the right thing* rather than building *some thing right*. At one time, a lot of discussion was going on in the community about whether User-centred design and Agile could work together[1]. In Lean, another issue arose in practice. There was no space for the designer because the *process* was meant to facilitate design in the place of the designer and as a result of experts collaborating. The same problem happened in design thinking. Design expertise was replaced by the coordinated activity of a group of people. The question arose whether the *facilitator* spot should be given to a designer, which would rationalise the position of the designer down to one, presenting a practical issue to teams made up of more than one designer. In summary, even when the whole team bought into one process and was interested in making it succeed, we spent a lot of time discussing how to practically organise the activities in order to get the process to work. Even with the same people, these efforts had different results from each project to the next.

With this short summary of the issues I have experienced in design practice, I would like to illustrate that design work unfolds not according to the prescriptions of design, but according to organisational practices which are far beyond the control of the designer. Books about design often make it sound as if the designer were in control. Some books are more sensitive to this apparent disparity between these prescriptions and the realities of design practices. I had bad experiences, where I have worked with software engineers for who I spelt out in great detail the most accomplished design specifications, in many hundreds of pages of words and visualisations. And the outcomes were as if the design had gone through a meat grinder where it had slowly died a painful death. I have also experienced the best times of my life, where I hit the ground running, and worked with software engineers on very sketchy ideas discussed over pints in the pub, gathering pace in the hands of the team, and the design went live and worked wonderfully. What was the difference in the design process? Nothing, and everything. Within each organisation, even each project, the constellations of design work are unique and have to do with the type of the business and

[1] Boxes and Arrows website: An Answer to the Pains of Integrating Agile and UX (http://boxesandarrows.com/an-answer-to-the-pains-of-integrating-agile-and-ux/).
Boxes and Arrows website: Bringing User Centered Design to the Agile Environment (http://boxesandarrows.com/bringing-user-centered-design-to-the-agile-environment/)

management, with the engineers, the other designers, the place of work, as well as the personal backgrounds and situations of each of us. We try to manage these daily contingencies through the design process. However, prescriptions of the design process are not sensitive to what is actually happening in practice. The design process has much less to do with the project outcomes than the social factors which arise when people work together. In my experience, it is not ever possible to stick to a design process. In fact, it is a constant negotiation in what ways we would be following the design process we have chosen. In all my past experience, I could – to the best of my conscience – not make our design processes accountable for whether a project ended up dead, or being hailed a success.

Nevertheless, within digital innovation, the design process is understood to make or break successful innovation (Brown, 2009; Buchanan, 2015; Martin, 2009; Verganti, 2008, 2009). Designers are encouraged to think about how to innovate and improve the design process within their organisations. Design teams devise and propagate their own design processes, and hope they might even catch on with other design teams (see, for example, Google Venture; Intercom Inc., 2016). In my own experience, a designer is expected to stay in touch with the latest developments in design methods. My colleagues and I therefore read books and go to conferences which are all about the latest methodologies – shaped in the form of design processes – ready to be applied, ready to be tried out. These books, conferences, and training events are sites of great hope for the improvement of the conditions of design work. We designers often leave these events brimming with excitement about finally having discovered a process which might work. A process which will once and forever fix the issues we have in our organisations, with our colleagues who do not understand design, with our fledgling development processes, and with products whose success is pinned to our designer hats, while we cannot explain why people end up buying them – so flawed are they, and so full of bugs.

A big part of designers' workday is concerned with the innovation of design – to make design work better. The experience from practice tells us that design doesn't currently work in the ways it says it does. There are too many issues, and if it does work, it seems it does so by coincidence. The conditions of design work are opaque. Our experiences, the practitioners' experiences, tell us one thing. But the prescriptions of the design process tell us another. We try to follow them, but it seems impossible.

As a practitioner, I ask myself, how can we make sense of design? Efforts are made to innovate design, find better ways of understanding it, applying it, teaching it, studying it, and better connecting the so-called fields of theory and practice (Bohemia & Harman, 2008; Findeli, 2001; Friedman, 2012; Kolko, 2010a, 2010b; Margolin, 2013; Oswald, 2010; Stolterman, 2008). However, in practice, we are still struggling, and that struggle is the reason for this Ph.D. This is also why I have made the unusual choice of defining my research question out of my practice experience as a designer, rather than out of the review of research literature. My aim is to provide a new way of understanding design, that will make visible the situated contingencies and negotiations of design work, in order to open the black box of design.

1.3 GAP AND RESEARCH QUESTION

As I have reported from design practice, there is an idea about design, that it can generate human-centred innovation, and that the design process as the description and export of a particular *designerly way of thinking/knowing* can help teams produce innovative solutions which work for people. Experiencing the large gap between this idea of design and what I observed in practice, I realised the need to research human-centred design practice. The research question outlined in this section has arisen from design practice, and this is reflected in the decision to define the research question before the literature review. The concern of this thesis is to find out more about what human-centred design is, what it is made up of, and how it is used. When we have this knowledge, we can have more confidence in our assessment of what kind of *design* it is we aspire to, and what we are trying to innovate. We rarely ask on what assumptions our ideas of design are based. We may be trying to get an inherently flawed concept to work, and it may be time to reconsider what design is, and how we use it. Who says that *design* is as important and as reliable as it is claimed to be for the outcomes of innovation? Who says that *design* can do what is assumed it can? And where are two designers who agree what *design* is? In fact, design may never work *better*, as hard as we try to get it to work. The research question for this thesis has been refined over the course of the initial literature review and the pilot study; however, the observed gap and need for research come from design practice. The refined research question follows the original observation that there is a particular idea about design, which is different from the experiences of design practice. This difference presents itself as a black box, a phenomenon which is opaque and unexplained. What is missing is an

illumination of how design as an idea and design practice are constituted and constitute each other. The research question is, therefore, *How do design as an object and design practices interrelate in human-centred design?* If the workings of the idea about design as an innovative process can be known and theorised, it will be easier to navigate this practice as a competent designer. This research proposes a new way of studying and making sense of design. Instead of continuing to take the idea and representation of *design* for granted as an object, in this thesis I turn around the lens and direct it towards the making of design as an object in practice. Experiences and ideas of design are always multiple, and design as an object is therefore continuously emerging. This thesis investigates design as a thing and how it is made up in practice. For this investigation, I adopt a sociomaterial form of inquiry. In sociomateriality, a clustering of sociomaterial relations serves to produce the object (Gherardi, 2006, 2010, 2012). The lens of sociomateriality allows visibility on these relations-in-action, which make visible and constitute an object. I draw on Gherardi's three levels of readings in order to structure my analysis (2006, 2010, 2012). Adopting a framework based on Gherardi (2006, 2010, 2012), as well as on concepts from Suchman (1994, 2002a, 2007), Haraway (1988, 1991), and others, this thesis will investigate the sociomaterial relations-in-action in design practice, and it will utilize this view on the contingent and ongoing negotiation around the bounding of relations into objects and subjects of design. Following Gherardi, *practices* are the mode of ordering knowing and action. Investigating design practices as such I will pay particular attention to the effects of practices, which, as the purpose and reasons for practices, contribute to their reproduction.

1.4 RESEARCH OUTLINE

My research is made up of data from an ethnographic study with 26 designers working in the U.K. digital innovation industry, a wider distributed questionnaire with 59 designers worldwide, 129 design job adverts, and books used by designers. This research is a necessary contribution to the ways we understand, apply, study, teach, and practice design. My contribution is the opening up of the black box of human-centred design, through the investigation of sociomaterial relationships and effects. Representations of design claim to depict the nature and capability of design as a human-centred methodology to synthesise different knowledge entities. However, I will show that this claim works to obscure that the different knowledge entities are also made up in practice, by locating and separating them out within the design process. As I am going to argue, design may be better

understood as the simultaneous splitting and synthesizing of the human and the technology for the purpose of reshuffling orders and positions of people, things and their knowledges within organizational practices. Designers reconfigure these orders and positions through a simultaneous locating and separating of knowledge entities and a synthesising of these by being their mediator.

This Ph.D. thesis has a slightly different structure than a typical thesis in three points, and I would like to explain these three points here.

First, it has been made clear in the previous section that the need to research has arisen from my personal experience in design practice. There is a gap between the idea of what design is and how design unfolds in practice, which leaves design practitioners in the dark as to the guidance which can help them navigate their work. Whatever resources are available to design practitioners, be they education, training and literature, do not support practitioners sufficiently in solving this issue which arises in practice. I claim that my experience of design practice is not my experience alone, but that it is an experience shared with many practitioners. Indeed, in the research, I have found the disparity between the idea and the practice of design to be not only the general theme but also the key aspect in the constitution of human-centred design practice. As introduced at the beginning of this section, the representations of design and the enactment of design work together to configure orders and positions of people, things and their knowledges within organisations.

The second point is that the methodology chapter has been placed before the design literature review, due to the methodological commitment of this thesis to sociomateriality. In sociomaterial practice, discursive and materialsemiotic activity, such as writing about it, contribute to the existence of a practice, participate in practice, and thus make up a part of the analysable data (Gherardi, 2012, pp. 103-131). Theoretical research takes an active part in constituting a practice, as Bourdieu (1990) argues:

> *"There is only a perspective seeing, only a perspective 'knowing'; […] The problem is no doubt that one cannot escape from the play of inverted preferences, in order to produce a genuine description of the logic of practice, without bringing into play the theoretical, contemplative, scholastic situation from which all discourses arise, including those that are most determined to valorize practice." (p. 28)*

It is therefore important to highlight theory as what it is: A participation in practice. The conditions of studying and representing practices "can have world-making effects" (Puig de la Bellacasa, 2011, p. 86). The theory and discourse on design is a part of what design is (J. Beck & Stolterman, 2016; Mareis, 2011). This thesis and I are not exempt from participation in design practice.

Thirdly, the representation of the data and its analysis and discussion are entangled throughout chapters 3 to 6, which I will call the *analytical chapters*. As I will explain in more detail in the Methodology chapter, each analytical chapter works towards building up an account of design practice. In the analytical narrative, different aspects of design practice are visited and accumulate to a particular concept about design practice. The core argument is made in chapter 6. Just as it is impossible to disentangle personal experience and an objective reality (Bourdieu, 1990), or data collection and analysis (Pink, 2009, pp. 8, 119), it is from the methodological perspective of this research not possible to separate the presentation of the data from the discussion of the meanings of it. Through my research and through my writing, I am making sense of the data and am drawing up my account of human-centred design practice.

1.5 CHAPTER OVERVIEW

In order to give a brief overview, I'll outline the structure of the thesis (see Figure 2). In chapter "1 Introduction", I have outlined the need for research and the research question. This chapter is an introduction which shows how my personal involvement in the practice of design in digital innovation has defined the interest in the research, the gap presented in design practice, and how this has informed the research question. In the introduction, I describe the research question that has emerged from design practice. How do design as an object and design practice interrelate? In chapter 2, I will develop the research framework, which is grounded in concepts of practice theory and sociomaterial practice. This chapter describes the methodological lens that is crucial for the layout of the whole thesis – the sociomaterial lens includes discourse in its analysis, and therefore, the methodology chapter will precede the literature review. After the methodology chapter, the analysis and discussion of design practice data will follow in chapters 3-6.

In chapter "3 Design as a human-centred methodology", I will focus on the *object* of practice, illustrating the ways in which design is represented, institutionalised and used as a guiding structure. I describe how a case is made for a particular idea about design, while at the same time the practice

of design looks very different, which brings to bear the question of why it is so different. I find first hints that human-centred design process models, as representations of design activity, do – rather than functioning as mere descriptions of design – participate in practice and have a purpose. I will uncover this purpose in the course of the following chapters.

In chapter "4 Design as ordering," I will focus on the *action* of practice, illuminating how the making of design as an object is stabilised in practice. I describe design work in digital innovation as an attempt to order activities, and the designers hereby benefitting from improved negotiation positions within organisational practice. In this chapter, I look closer at the activities which make up everyday design work. Here I am able to trace how designers enact positions of ordering activities and information. Through separating persons and what they know and do within the design process, the designers make up knowledge entities which they anchor in locations. Designers put themselves in the position of synthesising all other locations and being their mediator. Through this, the designers' position is flexible and can dominate in negotiations. The designers' position is not tied to a location and encompasses all knowledge entities in synthesis. For example, designers isolate the location *implementation* and assign its responsibility to the engineers. Through their flexible position within the design process designers can try to enforce their descriptions of technology on those who are concerned with the implementation of the technology.

In chapter "5 Knowing, being and acting as a designer," I will investigate what it means to be a designer in human-centred design practices, what it means to be a *subject* of design, how designerly knowing is enacted, and how designers engage in the making up of design as an object. The chapter looks at the designer identity, which is just as entangled in design practice of separating the human and the material, as it is entangled in the sociomaterial configurations in which the designer works. The designer body is understood as capable of transforming knowledges and speaking in the users' place, so it is with this special capability able to reach an exclusive position which is difficult to access.

I will, therefore, have covered three foci of viewing – the object, the action, and the subject in design. These are not separable; they are merely an emphasis on different modes of viewing.

In chapter "6 The making of design," I will pull together all these threads and argue my account of design practice. The analytical narrative is cumulative and develops with each chapter towards the

main argument in chapter 6. In this summarising chapter, I will make the core argument: Design is an object which enables a continuous splitting and synthesising of the human and the technology, for the purpose of reconfiguring orders and positions within organisations, left to the exclusive use of the designer.

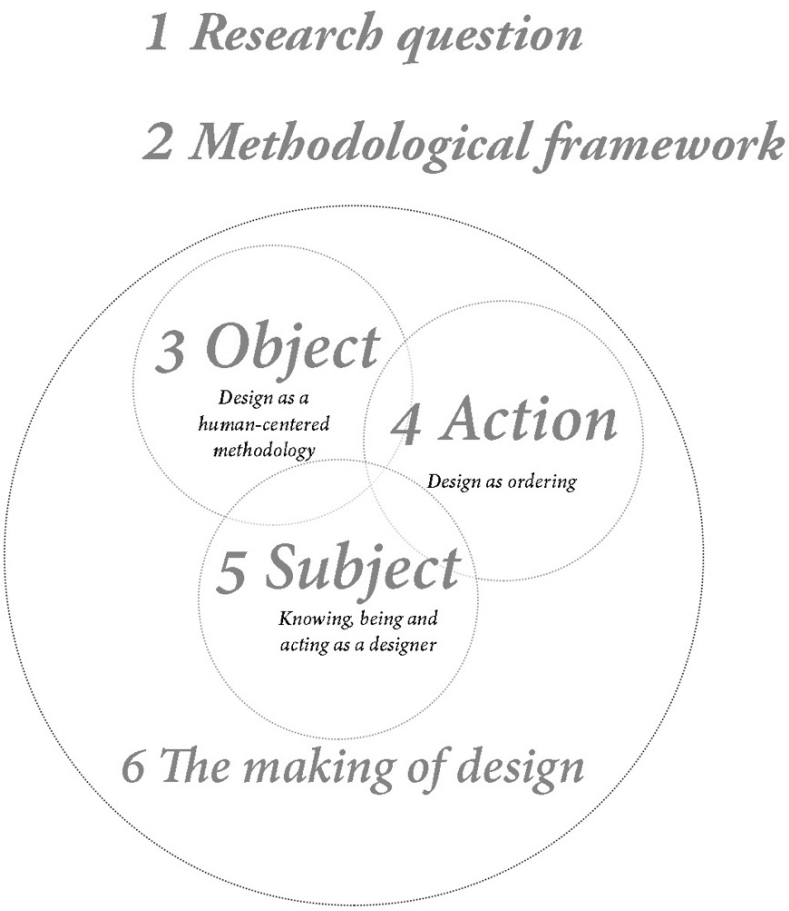


Figure 2: A graphical outline of the structure of the thesis, including the emphasis of object, action, and subject in the analysis

2 STUDYING DESIGN PRACTICE

In this chapter I will develop the theoretical backdrop for this thesis, covering practice theory, materiality and sociomateriality, and I will derive the analytical framework of methods to investigate the recursive nature of the practice and the reproduction of design as a continuously emerging object.

I will use the term *object* as an entity which people talk about as a *thing*. For example, *global warming* has become a thing, and *big data* has become a thing. These are terms from the news or from professional communities, but precisely not only terms, but also concepts to which meanings, words, images and many combinations of all these, belong, as well as physical matter, such as exhaust pipes, sun rays and dry soil, or servers, wires, zeroes and ones. Latour (1993) speaks of the "ozone hole" as a thing that comes into being between meteorologists, chemists, politicians and ecologists who speak about "refrigerators, aerosols and inert gases […] cyclical fluctuations unrelated to human activity […] international treaties, moratoriums, the rights of future generations, and the right to development" (p. 1). An object is a thing which is part matter, part idea, produced by many people, who all have slightly different understandings about it, yet a thing is still altogether whole and difficult to separate. The object is a fluid epistemological entity and continues to emerge and to come into being, through people understanding is, speaking about it, and acting upon it (Gherardi, 2012). *Design* can be viewed as an object which is made up of tangible and intangible parts – part matter, part idea. I speak about the *object* as a *thing* which is produced and brought into being by many people who have understandings about it and who speak and act upon it.

To place the methodology before the literature review is a methodological choice of this thesis. A literature review describes the existing research in a field, a gap in this research, and the emerging need for the present research (Kamler & Thomson, 2014, p. 30). Research generally equates with *knowledge*. Existing research represents existing knowledge, and new knowledge can, in this understanding, be created through conducting more research. To *know* is traditionally understood to be theoretical, while practice is understood to be the application of knowledge (Schön, 1983). Traditionally, only theory was able to know what was wrong with the site of practice. This is why

literature reviews are conducted first in order to find the gap which would need to be illuminated. However, I follow a tradition of understanding knowing as always practical, and it is with and through the materials practitioners work with (Schön, 1983). As I will explain further in the section "2.2.1 Practice as knowing," professional work practices constitute through the knowledge which is local to the practice. Research practices have their own knowledge, as have practical design practices. Design theory was not able to resolve the issue I experienced as a practitioner. Theory had been the first port of call for investigating these issues. In hindsight, it is obvious that the theory claiming to know about practice had created the problem I experience in that practice. In my design practice, I knew that there was a large, unexplained gap between the understanding of design, the theory – what it was supposed to be, and how it unfolded in practice – what it actually was. As a practitioner, I was able to experience, and thus *know*, the issues which occur in practice, and I was able to pose the question. I was able to ask in what ways the generally agreed-upon idea of design was different from actual design practice, and how these were related.

In this chapter, I will refine the research question to: *How do design as an object and design practices interrelate?* And sharpening the focus toward the engagement of designers, I add: *How do designers make up design as an object in practice?* According to the tradition of reflective knowledge in practice, practical questions are sufficient to define a need for study. As I will describe in this chapter, I will use sociomaterial practice as a research framework. Sociomateriality allows me to take a step back from the literature of the object of study, and to include the discourse in the analysis as a material-semiotic activity (Gherardi, 2012, pp. 103-131). The existing studies on design practice (the theory) are part of design practice, and help make up design as an object (Mareis, 2011). Therefore, I will not consult this theory about design for my own methodology, but I will include the theory about design in the literature review, investigating in what ways it contributes to the practice of human-centred design.

In its traditional role, the literature review is further supposed to define the theoretical landscape. The present research seeks to contribute to and act as an anchoring device within this existing landscape. This purpose of the literature review takes place throughout the thesis, but especially here in this chapter (in section 2.1 to 2.3), where I review the multiple locations of digital innovation in the theoretical landscape, as well as literature on practical knowing, materiality, and sociomaterial

studies of practice and design, and in the next chapter (in section "3.1 Making the case for design"), where I will review the literature that makes up the theory of design. I will continuously refer to these bodies of literature throughout the analysis and discussion (chapters 3–7). My contribution, however, will be to the field of design research, as a way of conceptualising design.

2.1 DESIGN AS INTERRELATING CULTURES OF INNOVATION

As mentioned in the introduction, design has strong roots in art (Margolin, 2013). Traditionally, designers have been described as possessing special intuitive abilities (Coyne & Snodgrass, 1991; Fisher, 1997). But design ability has had many descriptions. Friedman (2012) describes the diverse types of knowledge designers need to have, encompassing "learning and leading", "the human world", "the artefact", and "the environment" (pp. 144-145). The different abilities needed in design have often been presented as conflicting between "science and research" and the "art of human engagement based on ethics and on care" (Friedman, 2012, pp. 150-151). In attempts to reconcile these oppositions of art and science, design has often been scientised (Cross, 2001). Simon describes design as a rational devising of action towards desired outcomes, hereby trying to make respectable what he called otherwise "intellectually soft, intuitive, informal, and cookbooky" (Simon, 1996, p. 112). Another example named in the systematising of design is the design methods movement of the 1960s, which sought to rationalise designerly thinking (Cross, 2001). The design methods movement sought to resolve the "conflict that exists between logical analysis and creative thought" by systematising design activity in a methodology (Jones, 1963, p. 10; 1992). HCI (human-computer interaction) has a strong influence from psychology and computer sciences (Carroll, 2003, p. 62), and psychology has been described as the "science of design" (Carroll, 1997). The psychologising and scientising of design have been criticised as reducing the user and contexts of use to sets of well-defined conditions and "measurable variables" (McCarthy & Wright, 2004b, p. 25; Wright, Blythe, & McCarthy, 2006, p. 6). McCarthy and Wright (2015) called for reconceptualising what user experience design and user participation might mean in HCI, and Ingram, Shove, and Watson (2007) have proposed conceptualising the ways users acquire, script, appropriate, assemble, normalise and practice designs.

Nevertheless, these conceptual struggles can be seen as characteristic and significant for the kind of space design is, and specifically, for human-centred design in digital innovation. It is possible to treat

these diverse influences as different strands in the fabric that makes up design. This research directs attention towards the "practice" of design so it may be studied as a "culture" that is made up of "everyday knowledge and practices that surround the designer" (Julier, 2006, p. 70).

> *"A design culture is a constellation of elements that may in themselves be in tension and contradiction. The culture of design can incorporate a babble of voices, representing various interests and motivations." (Julier, 2000, p. 242)*

This thesis commits to paying special attention to the constellations made up of mundane everyday practices, social relations and material environments, within which designers work. Molotch (2003) describes how designers work amid "ensembles" of "interrelated objects and social practices" that make up the conditions of their work, in which they find the constraints of existing objects and practices, as well as the freedom to add new artefacts, and so renewing the constraints and freedoms available to them (p. 233). Kimbell (2012) proposes the concepts of "design-as-practice" and "designs-in-practice" to draw attention to the local organization of design as a practice, and in order to illustrate how designers' "culturally specific expertise can create new possibilities, but exclude others, and how these ways have become established over time in particular places" (p. 142). IDEO is named as a particular, well-known design consultancy, that seeks to extend the understanding of design as sensitive to the material practices of everyday life (Shove, Watson, Hand, & Ingram, 2007, p. 137). Designers participate in but do not solely control the material ecologies their products will inhabit, as Fisher (2004) demonstrates in his review of how the relationship people have with "plastic" has changed over time, and underlies cultural and social practices. Lloyd and Snelders (2003) investigated the design process of Philippe Starck's "Juicy Salif", and revealed between the imaginaries of "omnipotence" and "impotence" a fine web of practices constituting the existence and success of the object, which include the personal life experiences of the designer as well as the practical meaning that users put into the object of use.

Design practice influences how the things in designs end up being, and so, design has a wide responsibility for the things that are produced, as they shape the world as we know it (Papanek, 1985). Nevertheless, both design practices and consumption practices interweave and need to be seen as part of wider practices in which producing organisations create demands (Baudrillard, 1998). The "spiral of growth" is an economic "function of inequality" where needs are created to keep the

spiral going (Baudrillard, 1998, p. 53). It is thus important to shed light on production practices, and by extension on innovation practices, and on design practices as entangled in innovation practices. Innovation is a process of societal adaptation and of collective transformation, unfolding amid alliances of interests (Akrich, Callon, & Latour, 2002). *Production* and *consumption* could be interpreted as different alliances of interests, and it is therefore that questions need to be asked about how these mechanisms of innovation unfold, and in particular, design's role in that unfolding. Designers have been proposed as the cultural intermediaries between production and consumption, reading cultural practices and translating those tastes into values to be inscribed in products (Bourdieu, 1979). But conceptualising design as an intermediary may reproduce the enduring distance between production and consumption (Negus, 2002). Production and consumption interrelate in webs that influence how innovative products end up in people's lives, as visible in the study of the Sony Walkman as an artefact that helped to produce everyday cultures (Du Gay, Hall, Janes, Mackay, & Negus, 1997).

This initial glimpse on the literature about the theorising of design in innovation reveals that this is a diverse field with many different, partially conflicting ideas. Studying this field of design amid interrelating interests, cultures and practices will illuminate the makeup and the effects of design in digital innovation.

2.2 PRACTICES AS A CONCEPTUAL LENS

A promising field of theory for the systematic analysis of practice and its sociocultural relations is practice theory. Practice theory is a social theory that treats *practices* as the unit of analysis (Reckwitz, 2002). Social life is described as constellations of "routinized type of behaviour" which consists of "forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (Reckwitz, 2002, p. 249). Social life is understood to be organised in a dense web of relations that bundle to practices in the form of doings and sayings (Schatzki, 1996, 2002, 2010). According to Shove, Pantzar, and Watson (2012), social phenomena may be understood as the linking of "materials, competences and meanings", which can also give insight in how social change can be achieved. In their study, they used as an example a programme that was introduced in Japan to reduce CO2 emissions related to air-conditioning. People were encouraged to wear less clothing in the summer,

and more in the winter. Practical problems such as formal business wear, which was required in certain situations, were met with a mixture of practical changes: Fashion lines produced lighter clothes for business purpose, the then-prime minister and public business figures were seen wearing more casual clothes for meetings, and a guideline was made that office buildings should not be cooled or heated between 20 and 28 degrees Celsius. The programme was very successful and had a large reduction in CO2 emissions. This was achieved by changing the *meaning* of what appropriate office clothing was, the related *competence* of dressing for business, along with new *materials* of clothing that were compatible with the given temperatures. This example explained *practices* as a new framework for understanding social phenomena and also as ways in which interventions can be made. Practice-oriented theories are an important conceptual shift in the dominant analyses of social life, that assume a certain logic and rationality in people's actions but continuously fails to address these behaviours (Shove, 2010). Practice is a methodological distancing from the human mind as the driving force of activity. It offers an alternative conceptualising of action as located and organised in practice (Schatzki, 1996, 2002; Schatzki, Knorr Cetina, & Von Savigny, 2001).

2.2.1 PRACTICE AS KNOWING

Bourdieu is one of the founders of practice-theoretical thinking. He reflects on the production of knowledge as something anchored in the practical relations of action, in which we participate amid the constraints of our past experiences, embodied in the habitus (Bourdieu, 1990). Bourdieu speaks of social life as a "game" that is constructed by its participants. In his view, the participation in the "game" is structured through a person's habitus that ensures the "active presence of past experiences", and so recognises the "correctness" of the practice and one's own alignment with the practice (p. 67). Bourdieu explains learning and becoming a competent practitioner as the accumulation of past experiences with the "game", and increasingly being able to recognise the "game" and adapt to it. The "objects of knowledge" are thus not "recorded" but "constructed" in this subjective work of recognising and adapting (p. 52). Bourdieu assumes with the habitus an individual pre-structuring, through which knowledge is experienced, and which forms through experiences. The opposite can be said about the concepts of "communities of practice", where professional knowledge is defined through the community a practitioner belongs to (Wenger, 1998, 2000). Practitioners are "bound together by their collectively developed understanding of what their

community is about" (p. 229). This understanding is the competence of the community. Competent practitioners have access to and are able to use the "shared repertoire of communal resources - language, routines, sensibilities, artifacts, tools, stories, styles etc." (p. 229). According to Wenger, knowing always involves competence that communities have established over time, and a person's ongoing experience of the world. For him, these two aspects are in relation with each other, and if they are in tension and start "pulling each other", learning takes place (p. 227). He so describes learning as an interplay between competence and experience, whereby competence is negotiated within the community. In Wenger's concepts, however, the existence of *community* is presupposed. Alkemeyer (2013) criticises that in prevalent practice theories, practices either pre-exist and practitioners are merely recruited into the practice to maintain them, or practitioners pre-exist as subjects whose teleological endeavours are performed in practice (p. 117). Gherardi's concept of knowledge as "knowing-in-practice" seeks to resolve the tensions of individual/social and subjective/objective knowing through describing practice as a "mode of ordering" in which "the knowing subject" and the "known object" co-emerge (Gherardi, 2012, pp. 20, 78). In her account of practice, competence and the knowing how to proceed are guided by the idea about the practice (the object), whilst action reproduces this idea/object. Gherardi (2010) studied, for example, "telecardiological consultancy", a professional healthcare practice involving a general practitioner, a cardiologist, a patient and a technological infrastructure. Through ways of relating all these elements, the practice is performed. Each element is constituted by the relationship within the practice. To be a competent telecardiological consultant means to know how to participate in the practice, and how to relate to every other element in the practice. Gherardi derives that competence equates with the ability to perform within these relations. Practitioners have an understanding what the practice is and how it needs to be performed, and this understanding includes an aesthetic understanding of what a *good practice* looks like. The objective understanding of the practitioners is constituted in the subjective performing of the practice, and at the same time is the subjective experience constituted by the object of the practice (Gherardi, 2010, 2012).

For Gherardi, subjective experience and objective knowing mutually constitute and remake each other in practice. In this conceptualisation, one does not presuppose the other. Quite the contrary, her conceptualisation of co-emerging objective and subjective knowing does not only conceptualise knowing and learning but also leaves open the possibility for a change of the practice. Her focus on

the action that constitutes both, is the reason why, going forward in this thesis, the methodology will be largely based on Gherardi's understanding of practice.

2.2.2 MATERIALITY

There have been numerous works revealing the active participation of the material in action, illustrating how the material redistributes skills between humans and materials, conventionally ascribed to humans only. The material could thus be seen as actively shaping everyday human practices and experience. A study by Shove et al. (2007) on DIY projects demonstrates the reconfiguration of "the distribution of skill" between the human and novel materials such as "smart paint" (p. 16), that are "fast-drying, non-drip, water-based paints that 'know' how to go on to a door" (p. 55). Shove and Pantzar's study traces the co-evolving of the material and meaning of "walking sticks" in the practice of Nordic walking (Shove & Pantzar, 2005). Fisher studied plastic products and their affective significance to the practices of their owners (Fisher, 2004). The way things seamlessly fit into and carry the social practices of its owners is demonstrated by Miller's work (2008).

Material collaboration in everyday life can be extended to information and the digital. Although the digital is treated as immaterial, it lives through "large-scale material infrastructures of electrical power, air conditioning, servers, cables and buildings," and it actively participates in society through "constraints that bleed through to the human experience and to the social arrangements within which digital and virtual entities are embedded" (Dourish, 2017, p. 202). Tacchi's research (Pink et al., 2016) illustrates how "domestic soundscapes" help materialize memories of a father shaving, or create emotional balance for a person knowing "that there are other listeners to a late-night call-in show". O'Riordan (2017) shows how Genomics England, a bioinformatics project, is made real through media representation as a natural object whilst obscuring its political entanglements and effects, such as diverting public health care funds to research projects or promoting some kinds of bodies over others. Orlikowski (2007) demonstrates how Google search technology comes to matter in different ways when researching historical events from different locations, such as from the United Kingdom or from China.

In design, materiality has been taken seriously, as a means and product to knowing. In his account on knowing as a reflection-in-action, Schön (1983) describes design action like a "reflective

conversation with the situation" (p. 76). He illustrates how the designer makes a move, and then the situation "talks back" to which the designer responds again (p. 79). Gibson's affordances (2015) are an important concept in theorizing the relationship between the human and the technology, which were also taken up by writers such as Krippendorff (1989) and Norman (2013), in the sense of what one can do with technology. Gibson describes the relationship between humans and the material surroundings as "embodied" (see Gibson cited in Fisher, 2004), while Norman sees the material as subject to human cognitive interpretation: "[…] the brain had to process the information arriving at the sense organs to put together a coherent interpretation" (Norman, 1988, p. 12). Bonsiepe (1994) describes the interface to be a connection between "a body," "a purposeful action," and "an artefact" (p. 29), also implying a dependence on a purpose or intention. The separations between cognition and body, and human and technology, represent the cognition as active, and the body and the material as a passive matter. A hierarchy emerges between the human and the material. Pink (2009) warns that the "body/mind divide" creates an "objectification of the corporeal experience by the rational(ising) mind," and that instead, it would be more useful to "think of the body as a site of knowing" (p. 24).

Because of the importance that is paid to the *material* and to the *practical* in design, there have been efforts in conceptualising practices as an alternative to the tools of science and cognition. Stolterman (2008) draws attention to the limited capabilities of scientific theory to support design practice, and argues that any theory to support design practice must have a deep understanding of the "nature of design practice". Kuutti and Bannon (2014) analyse that current alternative approaches to conceptualising design practice have been, despite increased interest, too "unsystematic", and they propose a coordinated research program for conceptualising the "emergence and transformation of practices" through technology (p. 3550). Botero, Kommonen, and Marttila (2010) argued to reconceptualise the "design space" as "design-in-use activities" amid the changing possibilities through digital technology. They described different types of activities on the *creation-use continuum*, requiring more or less technical skill, such as writing new modules using an existing Application Programming Interface (API), or the personalization and configuration of software settings (Botero, 2013, p. 85; Botero et al., 2010). Verbeek (2015, 2016) draws attention to the relations between the technology and the human and contends that both are constituted as a result of the interaction. He points out the implications for interaction design and the ethical gravity of designing these

technological mediations. However, there is a certain form of human agency implied in Verbeek's philosophy of technology, making this moral responsibility inexplicable amid the emphasis that the human (and hence also the designer) is constituted through the interaction with technology. Wright, McCarthy, and Meekison (2003) base their theorizing of technology design on Dewey's pragmatism as "ways of seeing experience, to talk about it, to analyse the relations between its parts and to understand how technology does or could participate" (p. 52). McCarthy and Wright (2004a, 2004b) propose to conceptualise "experience-centered" design as *compositional* (listening to the "narrative structure"), *sensual* (grasping the "immediate sense of a situation"), *emotional* (being sensitive to "value judgments"), and *spatio-temporal* (being attentive to the "quality and sense of space-time"). Wright et al. (2006) argued that the design of digital technology requires a "radically interdisciplinary dialogue." In newer work, McCarthy and Wright (2015) reconceptualise how designers engage with use and user participation. They explore the relationships between designers and users, or researchers and participants, in participatory projects that they conceptualise as open to reconfiguration. These explorations bring interesting political aspects to the fore, such as that one important difference between design teams and users is that the designers are paid while users are not (p. 159). Jacucci and Wagner (2007) traced designers' creativity back to the material practices facilitating "persuasive, narrative and experiential interactions." Telier et al. (2011) describe design practice as "thinking the design" and as "seeing the design" in which it becomes possible to understand the "rhythms and place-making activities, in which collectives of actors and actants contribute to the object-in-design" (p. 15). Rosner (2012) used the example of a bookbinding workshop to illustrate how different kinds of material collaborations form activity. Material-material, material-human and material-workspace collaborations produce the "emergent patterns" of the work practice in which we "recognize the formative techniques and practices that hold lasting personal and cultural value." Following these accounts, the human-material interface may be understood to be an ongoing formation of skills, practices and collaborations between humans and technology (Suchman, 2007). Fuchsberger, Murer, and Tscheligi (2013) make the observation that interaction design "works with the content *and* the representation" where users interact with representations of content "through input and output modalities, like computer screens, keyboards or mice" (p. 2854, authors' emphasis). They add that both users and "designers are impressed by the materials" and by each other, in ways which are currently unaccounted for (p. 2860). Volonté (2019) analyses how the

"thin ideal" in fashion design is constituted not only by models' bodies but also by the constraints of the formulas employed to standardize measurements that do not work beyond size 12, thus materially enforcing size 12 as a barrier between *normal* and *plus-size*. Tholander, Normark, and Rossitto (2012) investigate how in interaction design materials enable, constrain, and so talk back to the designer. Taylor (2015) reminds us that it would be misleading to think that interaction designers have full control in the design of human-machine interfaces which can resemble large networks of "intermingling […] people, things, agencies, and infrastructures" (p. 53).

In a study on design studios, Wilkie and Michael (2015) describe the design process as the synthesis of "particularly homogeneous" entities that are negotiated through the "opening" and "closing," or "becoming" and "being," across distributions of labour and expertise, individual and institutional temporalities of schedules, different shades of user-involvement, and varying "patterning of invention/non-invention." The material is understood as crucial in design, and therefore, a conceptualising of material relations has been taken seriously. However, the material often takes on a particular role as "representations" of reality (Yaneva, 2009, p. 79). In an ethnography of architectural design, Yaneva illustrates the enactment of the studio as a proto-world, where architects "treat the studio as the world, a world that is to be re-enacted in practice, a world that is to be reinvented by design" (Yaneva, 2009, p. 85). Wilkie and Yaneva are reconceptualising the design studio as important sites of understanding how designs are constituted. They draw on the theoretical frames of Science and Technology Studies (STS), respectively Actor-Network Theory (ANT), which are radically different ways of studying sociology and technology. ANT describes humans and nonhumans as made up of the relations within which they exist as a "patterned network of heterogeneous materials" (J. Law, 1992, p. 383). Action, or the capacity to act, can alternatively be seen as distributed across these human and nonhuman actors (Latour, 2000). The fabric of the social is material (Latour, 1990, 1992, 1993, 2000). Latour speaks of "programs of action," made up of associations of human and nonhuman actors, that make up the world as we perceive it (Latour, 1990). Society and technology are not naturally separated as such, but they are "more like phases of the same essential action" (p. 115). What we perceive as *technology* are associations that appear stable through aligned viewpoints (p. 115). Technologies "always embody compromise. Politics, economics, theories of the strength of materials, notions about what is beautiful or worthwhile, professional preferences, prejudices and skills, design tools, available raw materials, theories about the

behaviour of the natural environment – all these are thrown into the melting pot whenever an artifact is designed or built" (Bijker & Law, 1992).

J. Law (2004) made the research method itself the object of study in order to argue for the making visible the "crafting and enacting of boundaries" that inevitably happens in research in order to deal with the "mess" of social relations (pp. 2, 84). STS is a decentring of the human from social life, and a zooming out onto the ontological perspective of the world made up of matters that associate to programs of action (Latour, 1992, 2000). But although STS has been a powerful and necessary weapon of critique against the goliath of science, more recently there have been reminders to look at its own motivations and practices that are just as entangled in politics as other research practices (Latour, 2004; Puig de la Bellacasa, 2011).

2.2.3 SOCIOMATERIAL PRACTICE

This research is positioned before the backdrop of posthuman STS, but more specifically on sociomaterial practice that returns to the human in order to highlight the politics of engagement within action.

> *"[There is a] durable dissymmetry among human and nonhuman actors. The response to this observation is not, however, to cry 'Aha, it really is the humans after all who are running the show.' Rather, we need a story that can tie humans and nonhumans together without erasing the culturally and historically constituted differences among them. Those differences include the fact that, in the case of technological assemblages, persons just are those actants who configure material-semiotic networks, however much we may be simultaneously incorporated into and through them." (Suchman, 2007, p. 270)*

A sociomaterial lens looks at the negotiations of sociomaterial boundaries, which are conducted by humans in practices. This fits with investigating how designers participate in making up design as an object. In this section, I am going to introduce sociomaterial practice as *boundary negotiations*.

Gherardi (2017) follows a posthuman tradition of understanding the makeup of the world. She views *objects* and *subjects* as emerging in action, whereby action is ordered by practice. In her work, she takes a *sociomaterial* approach to interrogate "how all the elements within a practice hold

together and acquire agency in being entangled" (p. 50). In sociomateriality, the tension of human/material is resolved. The "boundaries between persons and machines" are taken "to be discursively and materially enacted rather than naturally effected" (Suchman, 2007, p. 12). Rather than assuming certain elements as naturally human, and other as naturally material, sociomateriality speaks about how these entities are created in practice as *human* and as *material*. The making up of these entities in practice, and so the configuration of the world, is in constant negotiation and up for re-configuration (Suchman, 2007). The practices of technology-use are made up of constantly changing relations and figurations between the humans and the machines, and new technologies can be inserted, to form as "artful integrations" of new figurations (Suchman, 1994, pp. 34-35). Challenging the term "interaction" as maintaining an idea of naturally separate things which can (inter)act together, Barad (1998) highlights that things are never naturally an entity, but that they are always made up of relations. She coined the term "intra-actions" to draw attention to the entangled relations which make up things. She argues that "reality is not composed of things-in-themselves or things-behind-phenomena, but things-in phenomena" (p. 104). Barad calls these entities "apparatuses" which are "constituted through particular practices that are perpetually open to rearrangements, rearticulations and other reworkings"(pp. 101-102). Unlike many theorists in the field of sociomateriality, Barad worked on the theorising of "physical presence" of apparatuses, "or an ontological there-ness as phenomena in the process of becoming," dealing with the important realisation that "materialization is not only a matter of how discourse comes to matter but how matter comes to matter" (p. 108). Barad (2003) questions "the givenness of the differential categories of 'human' and 'nonhuman,'" and draws attention to "performativity" through which "differential boundaries are stabilized and destabilized". Performativity as "boundary-making practices" (p. 822), is for Barad the site of agency – and where the capacity for change lies:

> *"Agency cannot be designated as an attribute of 'subjects' or 'objects' (as they do not preexist as such). Agency is not an attribute whatsoever—it is 'doing'/'being' in its intra-activity. Agency is the enactment of iterative changes to particular practices through the dynamics of intra-activity. Agency is about the possibilities and accountability entailed in reconfiguring material-discursive apparatuses of bodily*

> *production, including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure." (Barad, 2003, p. 827)*

Barad draws on Haraway's concept (1991) of the cyborg as an "ironic political myth" (p. 291) which allows "boundary breakdowns" between the "human and animal", "animal-human (organism) and machine" and "physical and non-physical" and presents the opportunity for reconceptualisation of how entities and identities become objects and subjects, and how the negotiations around it unfold (p. 292). Haraway uses the "cyborg" as a concept to visualise the hybrid existence of bodies and identities.

> *"The cyborg is our ontology; it gives us our politics. the cyborg is a condensed image of both imagination and material reality, the two joined centres structuring any possibility of historical transformation" (Haraway, 1991, p. 292).*

The ontology of things and selves is political and never neutral (Haraway, 1991). Objects and subjects are enacted, and boundaries are negotiated and constituted through subjective knowing. Things and people are made and remade; they do not exist naturally. There has never been a neutral, innocent *whole*. And in the stakes of making these *whole* objects, there has never been an original *equality*, to which we can return:

> *"Every story that begins with original innocence and privileges the return to wholeness imagines the drama of life to be individuation, separation, the birth of the self, the tragedy of autonomy, the fall into writing, alienation […]" (p. 313)*

This thesis seeks to embrace "the skilful task of reconstructing the boundaries of daily life" (Haraway, 1991, p. 316). With the sociomaterial practice framework, this research will be able to reconstruct how the object of human-centred design is made up in digital innovation practice, how it is performed in practice, and what the effects of the practice are. The thesis will also look at how designers, as subjects, are involved in this making up of design.

> *"Like 'poems,' which are sites of literary production where language too is an actor independent of intentions and authors, bodies as objects of knowledge are material-semiotic generative nodes. Their boundaries materialize in social interaction.*

> *Boundaries are drawn by mapping practices; 'objects' do not preexist as such. Objects are boundary projects. But boundaries shift from within; boundaries are very tricky. What boundaries provisionally contain remains generative, productive of meanings and bodies. Siting (sighting) boundaries is a risky practice." (Haraway, 1988, p. 595)*

As Haraway (1988) emphasises here, "Siting (sighting) boundaries is a tricky practice," because seeing a boundary is part of making up the boundary (p. 595). It is a political concern. Being able "to see" is another practice which chooses to include some elements while it excludes other elements; "seeing" is a tricky business (p. 585). "The knowing self is partial in all its guises, never finished, whole, simply there and original" (Haraway, 1988, p. 587).

What Haraway draws attention to here is relevant for this research on design. That I demarcate *design* as a matter of concern in this thesis is part of my participation in the practice of design. For this research, I do not claim to stand outside of the practice of design. Rather, I disclose my involvement in design practice. I speak from this location within practice and do not claim to see fully, but only to see partially.

Bowker and Star (1999) trace how objects emerge through viewers first clashing with what they see. They describe that people can only see what they do not take for granted. The tension between what they take for granted, and what they see conflicting with it, creates the outline of the object.

> *"There is a permanent tension between the formal and the empirical, the local and the situated, and attempts to represent information across localities. It is this tension itself which is underexplored and undertheorized. It is not just a set of interesting metaphysical observations. It can also become a pragmatic unit of analysis. How can something be simultaneously concrete and abstract?" (p. 291)*

Things local to communities – present things – are taken for granted; only foreign things are represented in objects. In their argument, it is the tension between the local and the foreign – and the effort to make the foreign local – that defines the gap between object and performance in which change and progress occur as a continuous integration. It is thus that a relationship between the *object* and the *performance* of practice can be conceptualised. Change happens when working towards making some*thing* familiar and incorporating *it* into normal life. Bowker and Star (1999) describe

that the "naturalization" of objects means an integration and absorption of what people see into their everyday practices (p. 196); no difference can be perceived anymore, and therefore the object does not exist in any form of representation (p. 299). As an interim stage, they describe "boundary objects" as the "working arrangements that resolve anomalies of naturalization without imposing a naturalization" while objects are still perceived as a difference between viewers (p. 297). Boundary objects are representations which should aid communication while differences are perceived between communities.

J. Law (2004) conceptualises methods of knowing as organised relations:

> *"(a) whatever is in-here or present; (b) whatever is absent but is also manifest in its absence; and (c) whatever is absent but is Other because, while it is necessary to presence, it is not or cannot be made manifest." (p. 84)*

He describes how it is necessary in order to see something (a), to cut it out of its backdrop (b), like a figure which arises from the ground. Everything else (c) is invisible and Other. Reality – what is real to someone – can accordingly be described as a matter of perspective and locality: The "hinterland" as a "topography of reality-possibilities", where "some classes of possibilities are made thinkable and real", some "are made less thinkable and less real, and others are "rendered completely unthinkable and completely unreal" (p. 34). Which representations will become reality is a negotiation which Mol (1999) calls the "ontological politics." The existence of something is always the effect of our participation in bringing it into being. What something *is* is always political, and something can only be defined by defining what it is not (Bowker & Star, 1999). In communication, for example, it is necessary to say some*thing* to some*one*:

> *"One of the interesting features of communication is that, broadly speaking, to be perceived, information must reside in more than one context. We know what something is by contrast with what it is not. Silence makes musical notes perceivable; conversation is understood as a contrast of contexts, speaker and hearer, words, breaks and breaths. In turn, in order to be meaningful, these contexts of information must be relinked through some sort of judgment of equivalence or comparability. This occurs at all levels of scale, and we all do it routinely as part of everyday life." (p. 290)*

The negotiation around understanding what something is, is something we do every day. Issues arise when the collective labour that goes into the making of these categories and assessments remains implicit and hidden, because if objects and categories are treated as natural, the labour of making them goes unaccountable (Bowker & Star, 1999). Treating representations of reality to be *the reality* obscures the labour of negotiating these boundaries. "The uncertainty or the contingency of the realities made manifest in representations disappear" (J. Law, 2004, p. 132). However, objects and subjects are fluid. It is the labour – or the negotiation – where the defining work happens, and which reality wins. Mol (1999) points out that there are always different versions of reality that are enacted over one another. As such, this research is part of the enactment of design and research practices and will only claim to create one version of the reality of human-centred design practice. It could be said that with this research, I am intervening in practices of representing and negotiating realities in human-centred design.

Following these accounts going forward, I will take on board the sociomaterial practice key concept of presence and reality as a local and partial experience, negotiated through the means of boundary making.

2.3 METHODOLOGY

Drawing on the concept of sociomaterial practice as boundary negotiations, I will outline in this section the methodology that underpins the research in this thesis. Investigating how designers make up design as an object, I draw on Gherardi's three levels of readings in order to structure my activity of analysis (Gherardi, 2010, 2012). Following Gherardi predominantly, and in further detail also Suchman, Haraway, Mol, and others, this thesis will investigate the sociomaterial relations-in-action in design practice, and it will utilize this view on the contingent and ongoing negotiation around the bounding of relations into objects and subjects of design. Following these authors, I presume that how objects – things – come to be is the ongoing work of cutting them out from the *hinterland*, making boundaries, and making them up as figures. The more these things are taken for granted, the more their boundaries disappear again, and they are integrated and dissolved in the sociomaterial relations. However, objects and subjects are never clear cut; they are always part of ongoing cutting work. They only arise from differing viewpoints (Bowker & Star, 1999). Sociomaterial relations are entangled in many different and sometimes conflicting ideas. We are also entangled in many

practices (design practices, research practices, relationship practices) with various objects of practice, as well as with ideas about ourselves (who we are as a designer, as a researcher, as a partner). Realities are negotiated within entangled constellations of practice, with many – potentially competing and conflicting – ideas and identities.

I will use Gherardi's three levels of readings to guide the analysis (Gherardi, 2010, 2012). The three levels of readings systematise the work of analysis through conceptualising two angles, and then a third. These three angles are A) the object of the practice, B) the performance or enactment of the practice, and C) the effects of the practice by bringing together of the former two parts (A, B) of analysing the practice.

Gherardi assumes the object of practice to be the guiding and constraining principle of action, whilst the performing of action reproduces the object. For Gherardi, a practice is a socially recognised unit of activities by its practitioners (Gherardi, 2012, p. 161). Following this, *human-centred design* is recognised as a bounded unit of activities, and as the object of the practice, while the *designer* is the knowing subject of design. Human-centred design can so be seen as a professional practice – as a way of knowing. The understanding of what design is can be described as the object. Design as an object – that is constantly remade and kept stable in human-centred design practices – is the understanding of what design work is, what it is for, and how to recognise *good design* work. This object is negotiated in the performance and enactment of human-centred design practice. Design practitioners are competent practitioners by being able to perform within the practice, and by adhering to the guidelines that the object of the practice prescribes, at the same time as *human-centred design* as an object is remade in practice.

In human-centred design practice, it will be possible to observe the performance with which design as an idea is enacted. It is possible to observe in action how objects/subject and their boundaries are made up, and how they are integrated. "Knowing in practice" is visible in practice when observing practitioners in what they are "seeing", "doing", and "saying" (Gherardi, 2006, p. 229). It will be possible to see what designerly knowing is made up of and how the practice is reproduced:

> *"When a novice – or any practitioner in a situation – competently reproduces one of the common practices of his or her occupation, s/he is mobilizing a knowing-how which associates his/her body, social relations in action, artefacts, his/her knowing how*

> *to use abstract knowledge, the codes of his/her community, and his/her capacity to see, hear and react to others, and to the situation, as part of a 'seeing,' 'doing' and 'saying' deemed appropriate by the co-participants in the situation." (Gherardi, 2006, p. 229)*

As much as these objects and subjects are kept stable, the boundaries (of identity, of things) are renegotiable in their continuous enactment. Boundaries of objects and subjects are not fixed. They are remade in every moment. There is a contingency in this mutual constitution of *object* and *performance* that is open to change. In this view on practice, how a professional practice exists is constantly in negotiation. The emphasis of Gherardi's work is the recursiveness of practice, where the purpose of the existence of the practice and its enacting mutually constitute each other. In Gherardi's conceptualisation, the agency and the effect of practice lie in the reproduction of the practice. To recall, also Barad conceptualises agency as "the enactment of iterative changes to particular practices through the dynamics of intra-activity […] including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure" (Barad, 2003, p. 827). This reproduction between *boundary articulation* and *enactment* may be analysed through observing the *object* of the practice and the *performance* of the practice co-emerge. The main reason for choosing Gherardi's framework is her emphasis on the mutual constitution between the object and the performance of the practice. The relations between object and performance facilitate the negotiation of what the practice is, and therefore, what possibilities and constraints exist in practice. Agency is produced in the relationship between object and performance. Within this relationship, there lies the possibility of a change to occur in practice. But not only this, but also the purpose and the reason for the existence of the practice can be read from this relationship. Gherardi's third reading pays particular attention to this relationship between object and performance. This reciprocity of object and performance makes up the practice and produces its effect (Gherardi, 2012). Similarly, Barad and Bowker speak about the tension between A) the idea/a bounded object, and B) the action to bring this object into being, which contains the site of agency and the capacity to drive things forward and to have an effect (Barad, 2003, p. 827; Bowker & Star, 1999, p. 291). An empirical focus on the sociomaterial relations, as they produce objects, performances, and effects, will make visible the makeup of the practices I seek to investigate.

Reading the object of practice: Gherardi also calls this the reading from the "outside." The reading from the outside focuses on the objects of practice – the ordering principle that guides the practice in its performance. It is like a bird-eye view. The reading from the outside focuses on the boundaries. The boundaries constitute the objects of practice. This mode of analysis makes visible the "practice from outside" (2010, p. 504).

Reading the performance of the practice: The reading from the "inside" zooms close to the sociomaterial relations, which are performed competently in collaborative action. The relations between people and things are the focus during a reading from the inside. The action – the enacting and performing the practice – makes visible the "practice from inside" (2010, p. 504).

Third reading: In the third reading, the focus lies on bringing together these two modes of analytical reading (outside and inside), in order to understand the purpose and the effects of the practice. In the third reading, the reading of the effects of the practice, a relational assessment is made as to what the practice effects: "What does doing a practice do" (p. 507).

Gherardi demonstrates these readings in the practice of telecardiological consultancy, where she reads first from a viewpoint on the *outside* the institutionalization of the practice as "doing telecardiological consultation" (p. 503), and then from a viewpoint on the *inside* the transcripts of conversations between the cardiologist and general practitioner (p. 510). In the third reading, which is sensitive to the effects of a practice, she concludes that the telecardiological practice "is inscribed more in the socio-technical practice of reassurance than in the medical practice of preventing and coping with emergencies" (p. 519).

For Gherardi, the outside and the inside of practice are not separable, but merely a mode of looking at a practice. In order to capture the "texture of practice" (Gherardi, 2006) the researcher needs to explore the web of connections that makes up the field of practice by moving "up" and "down" the existing relations (Gherardi, 2012).

> *"The methodological principle of 'follow the practices' acquires concrete meaning when the researcher moves up from it to the institutional order or conversely moves down from it to the individual-in-situation. Or in other words, when he/she explores a connective web which branches in all directions and traces the social connections*

> *between individuals, collectives, organisations, institutions, the situated contexts in which these connections take specific form and all the intermediaries utilized by them – intermediaries that may be physical objects of artefacts, discourses and texts. And his/her analysis is conducted, not statically with description of a structure of connections, but dynamically as the constant becoming of a form which self-reproduces but is never identical with itself in that practices are incomplete and indeterminate until they are situatedly performed." (pp. 157-158)*

Practices interweave. However, there are more dominant practices than others within a web of practices – ones that influence many other practices, or ones that are singularly enduring (p. 156). There is nothing natural about demarcating a practice for the researcher; it is ultimately in the researcher's hand to "define and circumscribe some units of analysis within a seamless web" based on the questions of research or based on definitions by the practitioners (p. 160).

When Gherardi (2012) speaks of moving "up" and "down," it is not simply two perspectives, one from a distance and one close up (p. 156). It is more than that. "Follow the practices" means tracing the many, many relations that exist (p. 156). Each relation may be identified as belonging to a practice, and it is then possible for the researcher to view both the object (the ordering principle) and the local situated knowing in action of this practice. These sociomaterial relations exist as a seamless web. For the researcher, it is an ongoing ordering and re-ordering of the observed relations into representations of practices – how they relate and how they are nested.

I will resolve the methodological difficulty of following the practice in a systematic way, without separating things that are not separable, by making *narrative moves* where I move through the analysis in steps. Each move/step will cover both a view from the outside and from the inside, along with analytical thoughts on what the effect of the present activities is. Through these multiple moves throughout the analysis, there will be a *moving up* and a *moving down* several times. Gherardi's three levels of readings of a practice avoid an overemphasis of either the institutional order or the situated performance in action. It is a systematic approach, in which a constant moving between various modes of viewing allows the formation of a representational order, at the hands of the researcher. This multi-perspective approach allows the researcher to systematise the analysis, to shed light on the conditions of practice, and to arrive at an argument about the effect of the practice.

Finally, the methodological lens of sociomateriality and boundary-making is also an exploration for design practice. Practice-oriented analysis has successfully been used to analyse different practices, for example in learning, energy consumption, and health care, DIY, commuting, lifestyle migration, Nordic walking, or skateboarding (Gram-Hanssen, 2009, 2011; Harman, 2014, 2016; Higginson, Hargreaves, Mckenna, Chilvers, & Thomson, 2016; Kuijer, 2014; Lupton, 2017; Mol, 2008; Murphy, 2015; O'Reilly, 2014; Pantzar & Shove, 2010; Shove, 2010; Shove & Pantzar, 2005; Shove et al., 2012; Shove et al., 2007; Velten Schäfer, 2015). But little work was done on conceptualising design practice from a practice perspective (Neubauer & Bohemia, 2018; Neubauer, Bohemia, & Harman, 2016). There are studies on the materiality of creativity and making from a practice perspective (Fisher, 2004; Fuchsberger et al., 2013; Harman & Bohemia, 2007; Jacucci & Wagner, 2007; Julier, 2007; Krämer, 2017; Rosner, 2012; Sunley, Pinch, & Reimer, 2011; Telier; Telier et al., 2011; Tholander et al., 2012; Volonté, 2019; Yaneva, 2009), but few studies on design practice pick up on the wider embedding of these practices within organisational practices (Gedenryd, 1998; Kimbell, 2011, 2012; McCarthy & Wright, 2015; Taylor, 2015; Wilkie, 2010). Few of these studies look wide enough to identify the wider effects of the practice as such, in order to be able to bring design in relationship within wider organisational practices. Volonté (2014) argued that "design worlds" as a field of social practices have been explored too little, and that instead of researching design from the outside, it will be important for designers themselves to begin as a form of "self-awareness" to "study the design worlds up instead of studying them down" (p. 8). The aim of this study is to provide a new way for design of understanding itself, rethinking its idea about itself, and thus begin to find better ways of innovating and developing itself. An important parameter for this study is to go wide. Going for width rather than depth, comes with the disadvantage of covering areas and topics thinly. However, my hope is that this work is only the beginning of further in-depth work. Read more about this in the limitations of the research (in "2.3.2 Limitations").

For the representation of my study in this thesis, it will be important to once more point out the partial perspective, that I claim for my account of human-centred design practice. Following Mol's "ontological politics" I see myself and my research practices participating in the practices of representing and negotiating human-centred design. As such, I understand my research as making an intervention. As I will describe in the analysis, in design practices, the *innovation games* are proposed

for organising the production processes, and thus opening this space of negotiation, by challenging the current order of things, and offering design as a method of reordering. That designers practice this intervention, and enact their designerly reality within their human-centred design practices, does not mean that the proposed subjects and objects come into being as the dominant reality for the wider organisational or economic landscapes, but it means that this is a local reality enacted within the professional community of human-centred design. How far further this local reality is taken up, was not part of the research, and would be hard to trace from a small study such as this. Therefore, I need to be clear how I will use *is* throughout the analysis: I use "is" as Mol (2002) does, as a "localized term" that acknowledges that realities are always multiple and that realities are locally enacted (p. 55). When I say, "The designer body is a special kind of body," then I do not want to imply that this is true for designer bodies in all practices. I trace locally enacted realities amid the community of human-centred designers that I observed, interviewed and read, illuminating how this community of practitioners make up their objects and subjects.

2.3.1 RESEARCH DESIGN

Gherardi's three levels of reading will be used as modes of viewing human-centred design practices. A style will be adopted, where the description of the institutionalised shapes and objects of practice stand next to the close-up sociomaterial relations in action. I will make several *narrative moves* whereby upon each move, I will consider both the order of the activities and the performance of the activities. On the one hand, this gives context to the reader, and on the other hand, it is a contextualising of the action with the guiding principles and the aesthetic shape of the practice. By adopting this style, I am able to move from the larger idea about an area of activities to the local accomplishments of these activities, and after each move comprising of the larger and the local, I am able to come to a preliminary conclusion about these activities' effects. I so move in a narrative form from one site of practice to the next. Covering bit by bit the various sites of design practice, I will investigate the gap in design practice between design as an object and design as performance, shedding light on the conditions of making up design as an object. I will cumulatively build up an argument on how design as an object and design as a performance are interrelated and produce particular effects. I will step through this cumulative narrative in *narrative moves*.

The *narrative moves* through which I am going to investigate design practice will contain the *outside* and the *inside* view close together, as I do not want to create a binary separation in the representation of design practice. An *outside* and the *inside* view per narrative move allows a systematising of the analysis, whilst avoiding a separation. The work of demarcating narrative moves is at the hand of the researcher and is likely a work which is going to shape as it progresses. The writing work is part of the analysis work (Kamler & Thomson, 2014). The hand of the researcher in writing needs to be acknowledged.

The representation of this research study will be organised in narrative moves. The narrative moves will edge, chapter by chapter, closer to the final argument. However, they will not separate between the data, the analysis, and the discussion. As Sarah Pink points out, in ethnographic research, it is not possible to separate the data and the analysis (Pink, 2009, pp. 8, 119). As many studies in design use a separation between ethnographic inquiry and the discussion of implications (Button, 2000; Dourish, 2006), it is important to point out this difference. An ordering and processing of data are ongoing from the very beginning of the researcher entering the site of research. In the ordering of the data, I focus on the answering of the research question: *How do design as an object and design practices interrelate? And how do designers engage in it?*

2.3.2 LIMITATIONS

Conceptually, it is important to point out the implication of the researcher's practices in the coming to be of this research. The practices of research and design within which the researcher is embedded are implicated in the construction of such an account of sociomaterial practice. It is from my own position within sociomaterial entanglements of university institutes, Ph.D. programmes, and a multitude of other relations, not least also my decade-long involvement in the human-centred design of digital technology, that this Ph.D. thesis as a representation of design has come to be. This limitation exists, but it makes the validity of this work not less than that of any other research project.

It is a tricky terrain to assemble, interpret, and analyse the design materials and, in particular, the notes from my time with the designers. There are a number of practical issues.

1. I have worked as a designer in digital innovation, so I recognise practices, and I actively use my own experience to construct meaning. I cannot pretend to be a neutral researcher who curiously stumbles into a new field. But I can try and take at least some distance. Helpful were the regular check-ins with my colleagues and supervisors, who responded with curiosity to some of the stories from my research. It so helped me to remove myself a little from the view that all this is perfectly mundane and normal, and allowed me to view design practices with eyes that could imagine seeing the peculiarities and specialties of the everyday human-centred designer life.
2. The representations I made of my encounters with the designers could, in some worldview be true representation of the reality of designers' work lives. In another worldview, the one that I feel closer to, my notes are not representations of reality, but actions that work towards something, and that are guided by something. As Sarah Pink said, a researcher taking a photo is not only representing a research situation but is also experiencing and participating in a research situation (Pink, 2009, p. 100). In the moments of note taking my research practices intermingled with the designers' practices. While the designers were going about their designers' practices, possibly a little unnerved from the unusual extra person around shadowing and querying things, I sat or stood next to them with my research iPad, scribbling research notes. My research practices intermingled with their designer practices. My research activities themselves underlie strictly prescribed rules. Following good research practice, I will have to argue coherently and plausibly, and I will have to give an account of the path my story took. Both as a designer and as a researcher, the rules are that I try to capture the meaning of the practice as closely to other designers' perceptions as I can. This is the reason why I asked the designers who participated in the observations to proof-read and review the field notes related to them, as well as the interview transcripts. I will explain more about this in the "Data collection" section.
3. However, the third remaining issue is that written words are always a poor record of an experienced situation. The whole context of what I experienced as a researcher is firstly filtered already by what I deem appropriate to write down. If I was of poor health one day, or tired, or if I did not like the smell of a room, or if I wracked my head about

where I had seen that person before, these were pieces of information that I did not deem to be professional research practice to write down. And even with the professional focus fully on what the designers do, their surroundings, their experience, their work, this cannot be captured with words alone. Words can mean everything and nothing. They always depend on the context. Bourdieu uses the example of another theorist explaining that "Quia nominor Leo" does not always mean "For my name is Lion" but it could much rather mean "I am an example of grammar" (Paul Valery quoted in Bourdieu, 1990, p. 32). Schatzki (1996) writes about Wittgenstein's conceptualisations of the "language-game" – how words resemble objects which need recognizing, much rather than they have fixed meanings (p. 115). When the designer says "But … Just 10 minutes Zoom, you know …" it could mean anything. In that moment, knowing that Zoom was the remote conference tool, seeing the expression on his face, hearing his voice, having heard what he had said earlier, it was crystal clear to me what he meant; that he wanted to express his annoyance about the other person not making the effort to connect to the conference call. Reading it back from the notes now, several months later, some effort is required to recall this moment and its meaning. Reading it in a few years' time may not bring back all the moments. Having it read by another person might bring a completely different understanding, or none at all, if that person has no idea what it could mean. So, words are a precarious means by which to do research. However, this is not a problem new to this particular research at hand.

4. I have not conducted a systematic distinction between publicly and privately owned organisations when I researched the design practices related to each designer and each work environment. In the pre-observation questionnaire, I assessed the type of organisation (eg, B2B – Business to business, B2C – Business to consumer, Software, Marketing services, …), and the sector (eg, Health, Energy, ...), but I haven't explicitly inquired about ownership. I did get an impression from the context of what the designers told me, whether their organisation was owned publicly or privately, but I have neither explicitly assessed the ownership of the organisation, nor have I made a difference in the data collection where I did notice a different ownership structure. Organisational ownership can be assumed to be an important factor in the cultural practices of the

organisation. It is a limitation to this study that I have not taken this factor into account. Only during the interviews of the second stage inquiry, when I indeed had contact with a designer from an explicitly public institution, did I realise the cultural significance. This research wouldn't have had the capacity to work out the differences between the two contextual factors, but it would have benefitted from assessing whether an organisation was publicly or privately owned.

5. The aim of this study is to provide a new way of human-centred design practice to understand itself, so it may be the beginning of trying out new things, and innovating and developing design in different directions. Therefore, this thesis goes wide. Going for width rather than depth, this thesis covers a lot of ground, and it is not possible to develop all empirical and theoretical threads that appear. This is a limitation of scope, which comes with the aim of the research. The aim is to provide a ground work for future investigations into the various areas of human-centred design.

2.4 METHODS

As discussed in the Methodology, a system of methods will be employed in order to answer the research question. The methodological standpoint prescribes that the researcher is not neutral towards the findings and the research outcome. A significant source of knowledge comes from my own practices as a designer in the field, and this has been outlined in the introduction, where I speak about my experience. Nevertheless, it will be important to establish a position for myself within this research, where I can work as a researcher, rather than as a design practitioner. Therefore, I paid attention to creating some distance between myself and my design practice, and to be as true as possible to the experiences of the designers I work with, rather than simply using my personal experience. Pink (2009) writes about beginning an ethnography with an auto-ethnography to develop an awareness of how "culturally and biographically specific […] sensory categories" are used to "represent multisensory embodied knowing" (p. 52). Accordingly, I began my research by writing down my personal experience of design practice, of which I included some details in the introduction of this thesis, and I continued to keep a basic diary during the ongoing research activity.

In order to investigate design practice amid the methodological framework defined, I need to include the designers, the materials and infrastructures used, such as computers, design software, stationary, wider technical infrastructures, the products the designers work on, which are often connected to the internet, and many other people who are connected to design practices, both within and outside the organisations. The literature and means to articulate design practice, such as how designers and others speak about design, will also be very important.

I recruited designers through surveys and through contacting organisations, both through professional channels which I will outline shortly. The knowledge about which channels to use came from my personal experience. However, during the contact with the designers, I paid full attention to what the designers had to do and say, while I tried to hold back my own experience and to see their work with fresh eyes. This may be a blessing or an added difficulty; I recognised practices quickly, and I often knew what designers were doing and what they paid attention to, without them introducing me to an activity. I disclosed to the designers that I had a professional background in the field, so they were aware.

I conducted an initial survey about design methods in practice. I did not use the data, but it helped to shape the research question and to decide how to go about answering it. I decided to begin with shadowing the designers (Czarniawska-Joerges, 2007; Gobo, 2008) in order to observe close up what the designers do and say. From there, I came across the book-reading practice, which turned into its own data source, as I am going to outline soon. It was very interesting to hear the designers speak about their work and how others saw their work. And so, the idea to investigate job adverts for designers came to me. It became clear that it was significant how human-centred design was seen by organisations, in order to see how design fits within wider practices.

It was through this journey that my research has come about in its current shape. Through guidance from literature, training, and colleagues, and through the opportunities that opened up, I was able to conduct the research in this way. Along the way, I have developed as a researcher, and I have learnt to work with the methodology of sociomaterial practice.

My analysis and discussion consist of narrative moves utilising Gherardi's three levels of readings. They contain each a view onto the activities of design practice with an *outside* angle, and *inside* angle, as well as preliminary thoughts about what an activity *does* within the wider setting. The narrative

moves are structured as chapters 3-6. The final analytical chapter (6) pulls all these threads together and makes the argument. However, the research question which asks about the conditions of making up design as an object will be answered throughout these analytical chapters and does not alone rely on the final argument. In this way, the way is the goal.

I would like to talk a little bit about what issues I encountered while I was conducting the collection, analysis and discussion of the data. I very soon realised that it was going to be tricky to get access to the everyday practices of designers. On the one hand, I noticed designers' weariness about being exposed and possibly judged about their creativity, about their skills, and about the way they went about design. On the other hand, I knew about designers' desire to improve their conditions of work, to which I could speak with my research proposal. I believe that the desire to improve work conditions, or to at least find a new angle of viewing design, was enough for some designers to agree to participate in the research. As reassurance, and in order to offer a sense of control over what I recorded, I offered to allow the designers to review my field notes and the interview transcripts, and even to make edits if they wanted to. Some designers did and asked me to leave out information. Practically, it was very hard to get organisations to agree to let me observe and interview designers. Organisational secrets and novel product concepts are at stake. I signed NDAs (non-disclosure agreements) with two of the six organisations where I observed, and in all settings, the ethics agreements, in particular, the confidentiality agreements, were studied carefully. As an incentive and as a token of appreciation for their time, I offered gift vouchers of £50 to those designers who agreed to be observed and gave a fruit basket for the team. These expenses were taken out of the research budget assigned to the Ph.D. by the University.

A further issue was that at the beginning, it was not clear which data would inform the *outside* and the *inside* reading. At first, it seemed as if LinkedIn profiles, for example, could give a good picture about the outside view on the practice, as the profiles were a representation of design as an object, and of the designers as subjects. However, the LinkedIn profiles turned out to be just as much a representation, as a performing, of being a designer. I did not use LinkedIn profiles in the end.

Another issue that I discovered before I adopted the narrative moves, was that I had assumed I would be able to structure my analysis into *outside* and *inside* parts. At first, I focused on the *outside* representation of the practices of design. Gherardi (2012) speaks of a "typology of activities" (p. 161)

which is a method of identifying practices by their recursiveness, through analysing a number of "repetitions" (p. 161) of activities in order to identify them as a practice. After creating a representation of the outside reading, I had planned to delve into inside reading, before moving into the third reading which would be the discussion of the thesis, according to this plan. However, I realised that it would not work this way. Because the practices of design were such a wide field of activities, and because my aim was to represent design widely, I was not able to meaningfully separate the *inside* from the *outside* view. For example, when analysing the activity of one of the practitioners running a sketching workshop, I felt I needed to explain immediately what would guide such activity of teaching others to sketch. As a practitioner, I knew, but I also knew I somehow needed to represent the knowledge of the guiding principle of the activity, right next to the activity itself. This is how the narrative moves came to life, which I described earlier, in order to be able to represent the practices widely, along with their performances and guiding knowledge.

2.5 DATA COLLECTION

2.5.1 EMPIRICAL DATA OVERVIEW

I gathered the data in several stages. In the observation-based inquiry (OBSINQ), I focused on shadowing and observing activities. In the interview-based inquiry (INTINQ), I focused on gathering the mood in a broader way, and at the same time digging deeper into some ideas that arose during the observation-based stage. Furthermore, I included a content analysis of job adverts (JobADV), a survey (S2), and a review of both the designer-led literature (designer library) and of the general design literature. In the general design literature, I have included non-academic literature, for example, blog posts by practitioners. I also collected data from an initial survey (S1) and LinkedIn profiles, which I did not include. Due to the overall volume of the data sets and their richness, I had to make decisions on the scope. I eventually decided to systematically analyse the OBSINQ and JobADV, which are the richer data sets, to a full extent, and to use the INTINQ and S2 only selectively to enrich and back up findings from the OBSINQ. I also reviewed the literature in the field, which I identified as the designer-led literature (designer library), and the general literature.

Figure 3 is a visual overview of the data I collected, along with indicators that show to which extent I included the data in the analysis. The solid outline means the data set was fully and systematically included. The dashed outline means it was selectively included. The dotted outline indicates references to literature, which is hard to quantify. No outline means that this data set was not included. A table with this overview of data sources is included at the end of this section.

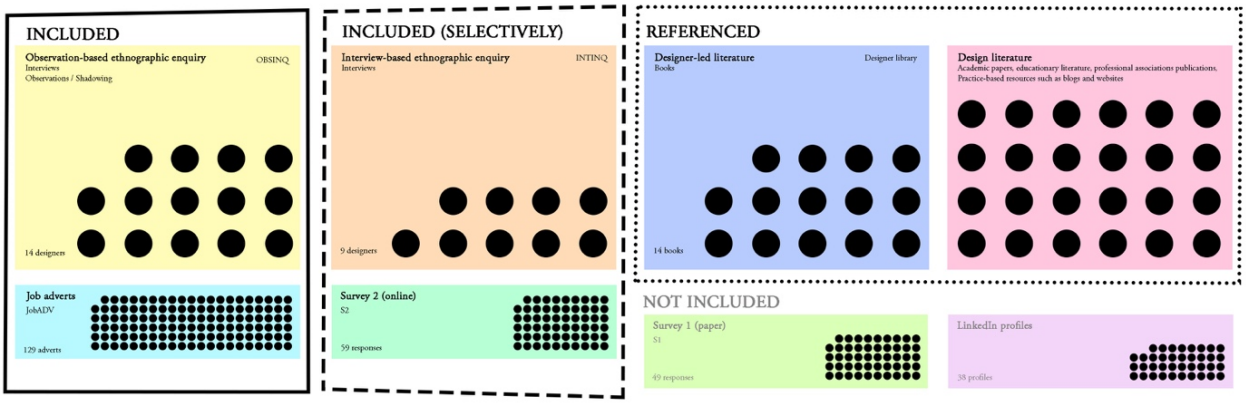


Figure 3: Visual overview of data sources

2.5.2 OBSERVATION-BASED INQUIRY (OBSINQ)

Through a survey (Bryman, 2012) which I disseminated at a professional UX conference in the South East of the United Kingdom in 2016, I reached 49 practitioners who were able to opt in for further research. The conference also generated leads with organisations that I contacted for observation work with their designers. I followed up with people who showed an interest in further research and reached 14 designers from six different organizations who agreed to interviews and shadowing (Czarniawska-Joerges, 2007; Gobo, 2008) at their work places.

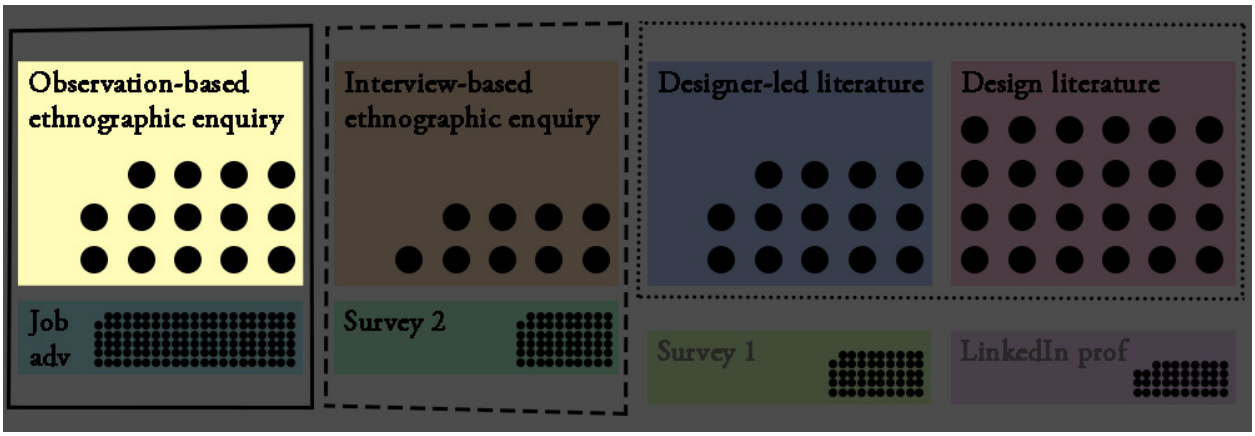


Figure 4: The observation-based inquiry (OBSINQ)

This work enabled very close contact with the practitioners, with at times daily contact for a large part of their workday, over weeks. At other times it was a shorter observation period, and at times it was condensed to conversations at their workplaces only. In total, during OBSINQ, I spent 145 hours with the designers. I took notes and made drawings on an iPad with an Apple Pencil. I took very few photos because of confidentiality concerns. The interviews were audio recorded and transcribed to MS Word documents. I transferred the field notes from the iPad onto MS Word documents. During this step, I anonymised the data. I sent each participant all relevant field notes and interview transcripts and gave everyone the opportunity to make edits. Some participants took up the opportunity. I then entered all document data into NVivo and coded and categorised the data according to activities.

If no particular data source is mentioned in the analysis, the empirical information stems from the observation-based inquiry. All other data sources are mentioned when they are referenced in the analysis.

The designers are all (apart from one) in-house designers, which means that they are employed by the organisations they design for. They are all (apart from one) mid- to senior-level designers, which means that they have at least five years' experience. All designers work for organisations in the South East of the United Kingdom. In the following, I list all 14 designers who took part in OBSINQ.

Pseudonym	Gender	Job Title	Organisation Type	Organisation size
Noah	male	Head of Design	Start-up financial sector	Small
Olivia	female	UX Design Lead	Start-up health sector	Small
Lena	female	Lead UX Designer	Software service provider	Mid-size
David	male	UX Designer	Tech innovation company	Large
Anthony	male	UX Designer	Tech innovation company	Large
Jack	male	Senior UX Designer	Tech innovation company	Large
Gerald	male	UI designer	Tech innovation company	Large
Miriam	female	Head of Design	Tech innovation company	Large
Richard	male	Director of UX	Creative company	Mid-size
Alan	male	Interaction Designer	Data tech company	Large
Charlotte	female	Product Designer	Data tech company	Large
Alice	female	UX Designer	Data tech company	Large
Johnny	male	UX Researcher	Data tech company	Large
Sophie	female	Head of Product Design	Data tech company	Large

2.5.3 JOB ADVERTS

I identified job adverts to be a very good description of what is asked of designers in their work. I have therefore analysed 129 job adverts, which I selected as a "systematic sample", as Bryman (2012, p. 191) recommends for content analysis (p. 293). The sample contained job adverts searching for designers to work on digital products or digital services. I had these job adverts sent to my email inbox as email alerts by the job site Indeed[2]. I had created the alerts through searching for the keywords "Interaction Designer," "Digital designer," and "User experience" in the United Kingdom. I had exclusion criteria[3].

[2] https://www.indeed.co.uk/

[3] I excluded: A) duplicates; B) too narrow descriptions, such as graphic design, print design, motion design, social media content design; C) software architecture and design, and IT consultancy; D) jobs that are too junior to have a clear profile (Junior Digital Designer); E) jobs that are too wide/or too senior (such as 'Director of mobile usability'); F) freelance with a contract length of a month or less; G) industrial designer, electrical designer, engineering designer

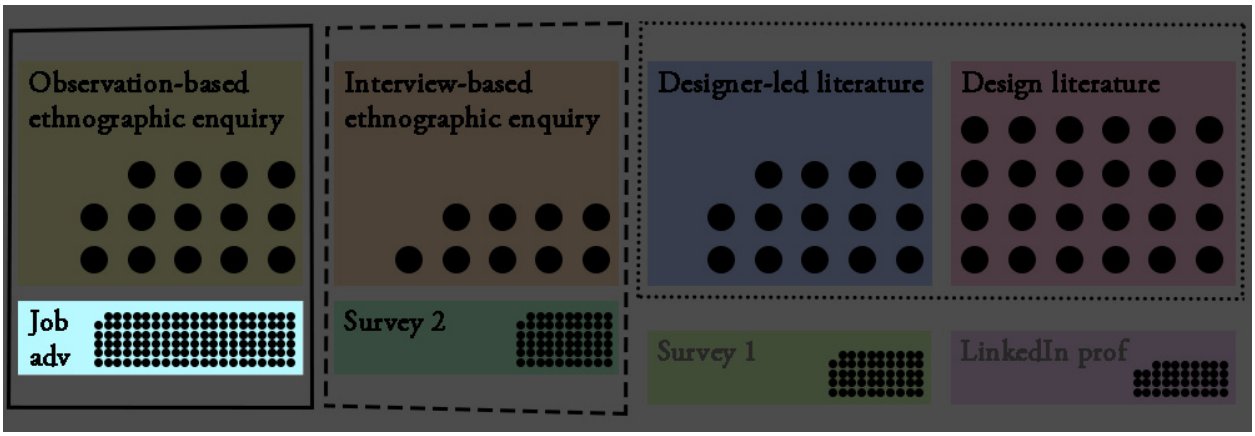


Figure 5: The job adverts data source

Bryman (2012) describes how important it is, when using media, to consider dates in the sampling, and proposes to use a "systematic sample of dates by randomly selecting one day of the week and then selecting every nth date thereafter" (p. 293). I decided to use the data from the time period October-December 2018, coinciding with the final phase of my data collection through OBSINQ. This generated 129 job adverts, sent to me as an email alert. They are from 3 days, which were randomly, albeit systematically, chosen. I decided to divide the month into a beginning, a middle and an end, and the following dates were chosen:

- October – end of the month: 29th October
- November – middle of the month: 19th November
- December – beginning of the month: 3rd December

I saved the job adverts as PDFs and analysed the text. I extracted common phrases into a text document and grouped them accordingly.

2.5.4 INTERVIEW-BASED INQUIRY (INTINQ)

Through a survey (S2) opt-in, I reached 9 practitioners (all in the United Kingdom) to do interviews. The contact with the participants was rather short (between 30 and 60 minutes, sometimes multiple interviews) and over a distance. During INTINQ, I spent 13 hours with the nine designers. Most interviews were done via phone and Skype. I audio recorded the interviews and transcribed them into text documents. I imported the data into NVivo.

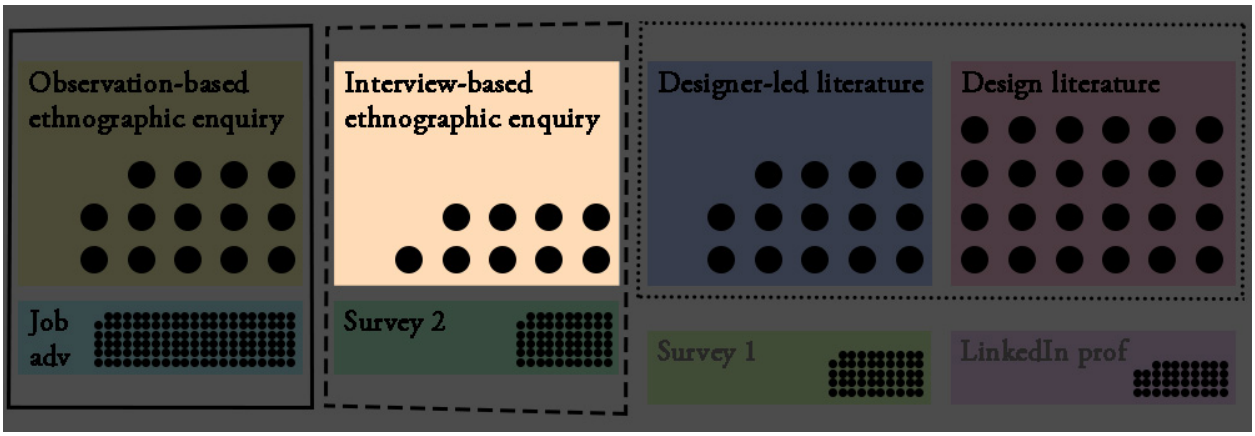


Figure 6: The interview-based inquiry (INTINQ)

Both the survey and the follow-up interviews were aimed at generating a broader snapshot of the mood of the community. The interviews allowed me to dig deeper into some of the ideas I had gained during OBSINQ. These ideas, in particular, were around *improving society and the world*, which I found to be a predominant motivation with many of the participants in OBSINQ. I was wondering at the time whether I had ended up with unusually socially minded designers, or if this was part of the wider practice. Indeed, I confirmed with the INTINQ participants that *improving society and the world* was part of the wider practice. This surfaced both in survey 2 (see below) and in the interviews in INTINQ. But although it was a strong theme, it was not the only motivation for designers to work in this field.

2.5.5 SURVEY 2

I conducted an international online survey (59 responses), which I disseminated in 2017 at a professional UX conference in the South East of the United Kingdom, four professional Slack channels, and on Twitter, Facebook and LinkedIn. I used Google Forms. The responses were collated in a Google Sheet, which I downloaded as an MS Excel file after the survey had closed. The questions were mainly open-ended, and therefore, the data set was rich. I decided to use the survey responses only selectively, in order to confirm questions which arose as part of the other inquiry. As part of the survey, I also obtained permission to copy 39 LinkedIn profiles (worldwide, but the majority United Kingdom). However, these were not used.

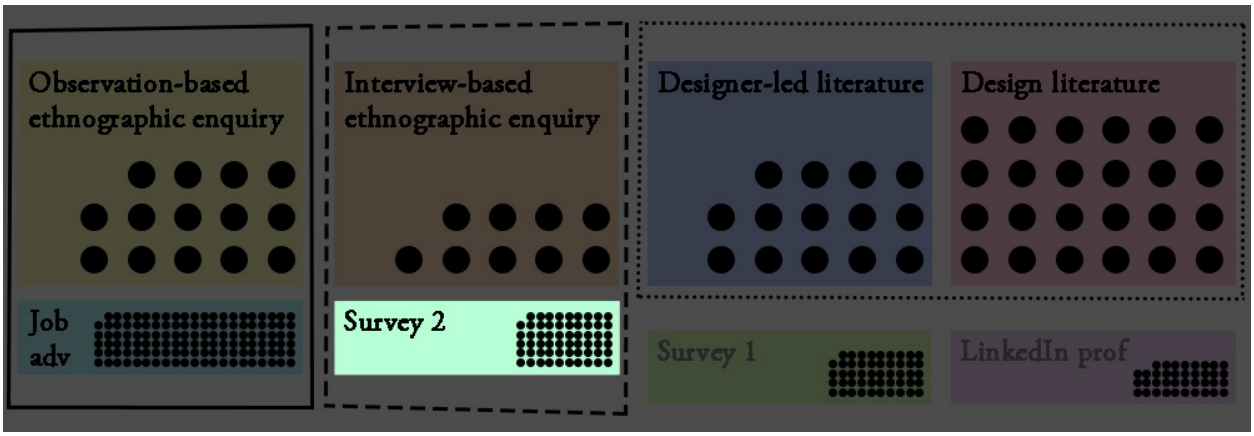


Figure 7: Survey 2 data source

2.5.6 DESIGNER-LED LITERATURE

I knew from my own design practice in digital innovation that book-reading is an important and wide-spread practice. The practice of book-reading also appeared during OBSINQ. Therefore, I have paid particular attention to the books which the designers mentioned during interviews and everyday practice in the OBSINQ and compiled a list to be used as part of the analysis. Because this list stems from too small a sample (14 designers), I additionally conducted a review of online resources around books for designers in human-centred design.

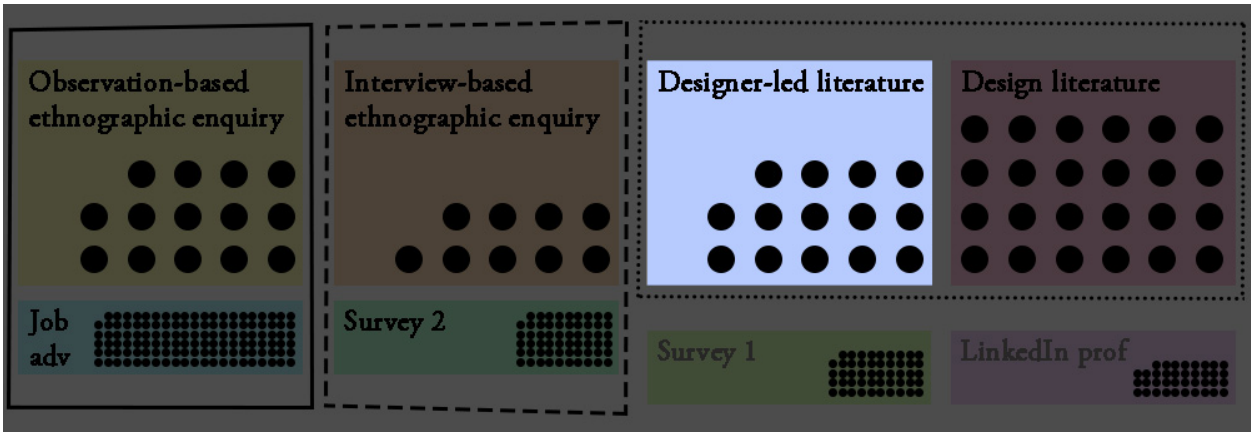


Figure 8: The designer-led literature

There are many blog posts and websites which recommend books for UX designers. Because of its comprehensiveness and its transparency of source, I chose a list of book recommendations compiled

from a survey of 20 designers by the website UXPlanet[4]. This seemed a large enough number to add to my sample. UXPlanet asked designers (worldwide, amongst those designers working at Uber, Amazon and Google) about the "5 design books every UX designer should read," and a wide range of books was mentioned.

Figure 9: The designer library of books mentioned by the designers

I will here list the 21 books which were mentioned at least twice and up to eight times, out of the sample of 34 designers. I will refer to this list as the *designer library*.

[4] https://uxplanet.org/5-design-books-every-ux-designer-should-read-b4f81361d02c

Table 1: Designer library

Short reference	Book title	Author	Mentions
Krug (2005)	Don't make me think!: a common sense approach to Web usability	Steve Krug	8
Norman (1988)	The design of everyday things	Don Norman	8
Gothelf and Seiden (2013)	Lean UX: Applying lean principles to improve user experience	Jeff Gothelf & Josh Seiden	5
Weinschenk (2011)	100 things every designer needs to know about people	Susan Weinschenk	5
Cooper, Reimann, and Cronin (2007)	About face 3: the essentials of interaction design	Alan Cooper, Robert Reimann, and David Cronin	4
Knapp, Zeratsky, and Kowitz (2016)	Sprint: How to solve big problems and test new ideas in just five days	Jake Knapp, John Zeratsky, and Braden Kowitz	4
Garrett (2011)	The elements of user experience: user-centered design for the web and beyond	Jesse James Garrett	3
Buley (2013)	The user experience team of one: A research and design survival guide	Leah Buley	3
Nodder (2013)	Evil by design: Interaction design to lead us into temptation	Chris Nodder	3
Young (2008)	Mental models: aligning design strategy with human behavior	Indi Young	2
Portigal (2013)	Interviewing users: how to uncover compelling insights.	Steve Portigal	2
Young (2015)	Practical empathy: For collaboration and creativity in your work	Indi Young	2
Warfel (2009)	Prototyping: a practitioner's guide	Todd Zaki Warfel	2
Maeda (2006)	The laws of simplicity	John Maeda	2

Short reference	Book title	Author	Mentions
Unger and Chandler (2009)	A Project Guide to UX Design: For user experience designers in the field or in the making	Russ Unger and Carolyn Chandler	2
Kahneman (2012)	Thinking, fast and slow	Daniel Kahneman	2
Norman (2004)	Emotional design	Don Norman	2
Anderson (2011)	Seductive interaction design: Creating playful, fun, and effective user experiences (voices that matter)	Stephen Anderson	2
Allen and Chudley (2012)	Smashing UX design: Foundations for designing online user experiences	Jesmond J. Allen and James J. Chudley	2
McKay (2013)	UI is communication: How to design intuitive, user centered interfaces by focusing on effective communication	Everett N. McKay	2
Lidwell, Holden, and Butler (2003)	Universal principles of design, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design	William Lidwell, Kritina Holden, and Jill Butler	2

Throughout the analysis, I will refer to these books as the *designer library* by marking in-text references with an asterisk. These books identifiably participate in design practice, by giving the designers information and ideas of how to proceed in their work.

2.5.7 DESIGN LITERATURE

The design literature is made up of a vast body of work that actively participates in design practice. I have decided to include academic literature in analysing how the object of design is made up. I treat academic literature as an active participant in making up the object of design.

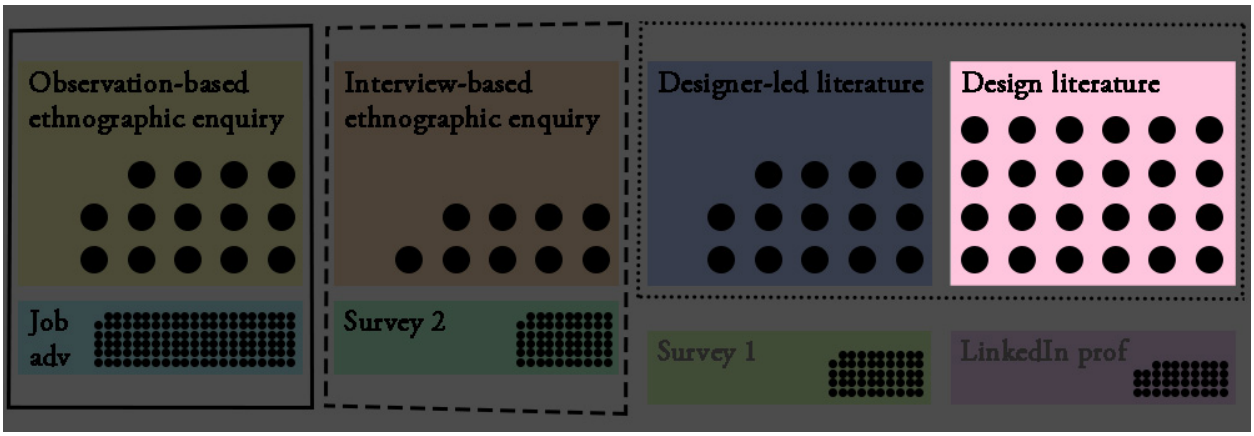


Figure 10: The design literature

I have also made a deliberate choice not to separate academic papers and journal articles from more practice-led publications, such as blog posts, websites and other resources outside of the academic domain. Kolko, a design practitioner who participates in academic practice, has even insinuated that academic papers are almost invisible in design practice (Kolko, 2010b, p. 80). However, it will be important to review a wide range of literature across academic research and design practice. I have explicitly included non-academic literature, and I will reference this literature in the normal academic referencing style.

2.5.8 SUMMARY OF DATA SOURCES

Table 2: Summary of data sources

Type of inquiry	Description	Abbreviation	Sample size	Area	Included
Observation-based ethnographic inquiry	Inquiry into how is the work done and guiding objects	OBSINQ	14	United Kingdom	Yes
Interview-based ethnographic inquiry	Inquiry into motivation versus experience	INTINQ	9	United Kingdom	Yes (selectively)

Type of inquiry	Description	Abbreviation	Sample size	Area	Included
Survey 1 (paper)	Collected tools and what design teams do with them	N/A	49	United Kingdom	No
Survey 2 (online)	Collected responses to designers' motivation versus experience	S2	59	international	Yes (selectively)
LinkedIn profiles	Designers presenting themselves as professionals	N/A	39	international	No
Job adverts	Organisations seeking digital designers	JobADV	129	United Kingdom	Yes
Designer-led literature	A systematic review of books which designers use in their practice	Designer library	21	international	Yes
Design literature	A review of academic literature on design practice	N/A	N/A	international	Yes

In summary, I used an *observation-based inquiry* consisting of interviews and observations, an *interview-based inquiry* consisting of interviews only, a *survey*, *job adverts*, and *literature* as data sources for this research. Due to the overall volume of the data I decided to use only selected information from the interview-based inquiry and from the survey, both of which I had added to

shed light on a particular question which arose during the observation-based inquiry. I systematically analysed the data from the observation-based inquiry, from the job adverts and from the literature, following my research framework. The research framework allowed me to systematically analyse the data sets according the principle "follow the practices", and to view practices from the "outside" and from the "inside" (Gherardi, 2012, pp. 156-167). The observation-based data was captured through field notes and audio-recording. These were transcribed, and then reviewed and coded using NVivo. For the job adverts, which I captured through email alerts, I used a content analysis approach to sampling, and then to reviewing the content in a text document. There were no data sources serving only one view on design practices, but they all allowed me to explore the web of design practices producing outside and inside views.

3 DESIGN AS A HUMAN-CENTRED METHODOLOGY

In this chapter, I will discuss what the idea of design as a particular *designerly way of thinking/knowing* looks like. I have discussed in the introduction how, as a practitioner, I struggled with this image of design, as it did not seem to fit with my everyday experience. As my experience as a practitioner is only partial, I am interested in gaining a broader view on how this image of design looks. In this chapter, I will review both academic and practice-led publications, which I will quote in academic referencing style. If a publication is part of the designer library, the in-text reference will be marked with an asterisk. This denotes a publication is part of the core library of books human-centred designers read. This does not mean that these are the only books they read. These are only those books which I was able to trace as a part of design practice (see the section on "Designer-led literature"). According to my methodological lens, design literature cannot really be separated into theory and practice literature conceptually. Publications are part of practice; they are part of the articulation of a practice about itself (Gherardi, 2012). Literature is part of articulation practices, and these practices in design intersect across the various communities of practice. Design practitioners come in contact with academic literature. People cross over and can be part of both academic design and industry design. Practitioners and book authors Jon Kolko, Bill Buxton and Bill Moddridge are mentioned as practitioners who work in the industry, and who regularly cross over into academia (Stolterman, 2008, p. 56). Also, publications cross over and are part of both practices. Books such as *The design of everyday things* by Don Norman (1988)* are widely referenced academically. The revised and expanded edition has 13,309 citations on Google Scholar to date. This book is also widely read in practice. In my review of books in design practice, it was mentioned eight times out of a sample of 34 designers. Although the practice of academic representation of design and the practice of industry representation of design are different, they are hard to separate, and they should not be separated, and therefore I will review literature from both practices.

At first, I will review how a case for design is made, and then I will review the three different strands that represent design before I extract the similarities between these different strands[5].

3.1 MAKING THE CASE FOR DESIGN

According to proponents of human-centred design, the quest for innovating through technology has not only brought improvement but has also jeopardised the wellbeing of people. There is a concern about the illusion of progress hiding the reality of unusable technology. This concern is expressed by Norman (1988)* when he says:

> *"If I were placed in the cockpit of a modern jet airliner, my inability to perform gracefully and smoothly would neither surprise nor bother me. But I shouldn't have trouble with doors and switches, water faucets and stoves. 'Doors?" I can hear the reader saying, 'you have trouble opening doors?' Yes. I push doors that are meant to be pulled, pull doors that should be pushed, and walk into doors that should be slid. Moreover, I see others having the same troubles - unnecessary troubles." (pp. 2-3)**

The above quote directs attention to the basic ways technology often fails people and their needs. During the British Human-Computer Interaction Conference 2018, a keynote presentation on artificial intelligence (AI) featured spacecraft computer HAL9000 from the film *2001* – a Stanley Kubrick film made in 1968. In the film, HAL interacts through voice with the space crew, and future technology is imagined as having human-like intelligence. The video clip shown at the conference was a satire which reimagined HAL as Amazon.com's Alexa[6]. Alexa is a virtual assistant and smart speaker that came to market in 2017 and reflects the current state of AI technology. In a comical twist, the computer (as Alexa) does not respond meaningfully to the crew's commands but instead reacts in clearly misconceived ways to what was requested. For example, it plays the music band *The Doors* instead of opening the doors of the spacecraft as requested, and instead of answering what the problem was, it finds information about a film called *Problem Child*. What we see is a computer unable to understand human speech and meaning, and the result is comical because we are

[5] Some content of this chapter is based on a paper: Neubauer, Bohemia, Harman, "Rethinking Design: From the Methodology of Innovation to the Object of Design", Design Issues, forthcoming
[6] "If HAL-9000 Was Amazon.com's Alexa," YouTube, Peter Pihl, https://www.youtube.com/watch?v=JepKVUym9Fg (accessed August 25, 2018

familiar with technology behaving in bewildering ways. The comments from the audience suggested that we need "better representations" of the context and the world surrounding these human-computer interactions. But Cooper (2004) argues the solutions to such problems do not begin with better technology:

> *"As engineers, their belief is in technology, and they have faith that only some new technology, such as voice recognition or artificial intelligence will improve the user's experience. Ironically, the thing that will likely make the least improvement in the ease of use of software-based products is new technology. There is little difference technically between a complicated, confusing program and a simple, fun, and powerful product. The problem is one of culture, training, and attitude of the people who make them, more than it is one of the chips and programming languages. We are deficient in our development process, not in our development tools." (pp. 14-15)*

Cooper implies that the solution to such fundamental problems is to find better production processes. The thoughts about how people might use digital products become a "surface-level patch on shoddy interactions [putting merely] lipstick on the pig" (Cooper et al., 2007, p. 5)*. He criticises the faith of technologists in technology and argues for a change in the "culture, training and attitude" of the people involved in the production processes. This can be understood as part of a larger movement stemming from user-centred design, where innovation begins with the user as the source for "novel product concepts" (von Hippel, 1986, p. 791). The ways users participate in innovation is visible and observable in the acquisition, scripting, appropriation, assembly and normalization of products in everyday practice (Ingram et al., 2007). Design in digital innovation has established itself as a human-centred framework for production processes (Cooper, 2004; Norman, 1988*). More recently, design claims to shape human experience, rather than only physical interfaces (Desmet & Hekkert, 2007; Hassenzahl, 2010; Kuniavsky, 2007; Norman, 2004*). With the increased focus on user experience, the user has become the "subject of design" (Redström, 2006).

Designers want to be a "force for good" fighting for "technology [integrating] in our lives in a human way" (Buley, 2013, p. xvi)*. "We are driven by [the] belief that our practice of interaction design can make the world a better place […] Interaction Designers strive to create meaningful

relationships between people and the products and services that they use, from computers to mobile devices to appliances and beyond […]", says the Association of Interaction Designers. The concern is to improve the "human condition" which is "increasingly challenged by poor experiences" (IxDA, 2017). Garrett uses the image of a labyrinth to illustrate how "frustrating and needlessly complex" the path of the user is made by typical technology products (Garrett, 2011, p. 16)*. Designers describe the complexity of technological products which are in urgent need of spatial and temporal ordering through better designs (Maeda, 2006)*.

So, design is stepping up to take on a central role in the mediating of innovation methods whereby the "power of design" is to perceive it as "the hub of a wheel" (Brown, 2009, p. 5). The Designer is understood as an "integrator of various functions" within an organisation (Bohemia, 2002). Design is represented as a better alternative to traditional organisational ordering (Buchanan, 2015; Dunne & Martin, 2006). As such design has attracted the attention of business management (Brown, 2009; Liedtka & Ogilvie, 2011; Martin, 2009; Osterwalder, Pigneur, Bernarda, & Smith, 2014; Stickdorn et al., 2011; Verganti, 2009). For example, a group of management academics was fascinated by the collaboration with Architect Frank Gehry and team, who illustrated to them how management might learn from design as a "mode of cognition and as an organizational practice" (Boland, Collopy, Lyytinen, & Yoo, 2008).

To sum up this introduction, design publications draw a picture of design as caring for the human experience of the technologies. In this picture, the producers of these technologies do currently not care about the humans, whilst design pits itself as the *force* which can change that. This force is the capability to function as a *hub* of innovation. This then makes a case for design as a human-centred methodology, where design is proposed as the way of navigating innovation in a way that works for society. In the following text, I will research the representation of design as a methodology of innovation, which will reveal the design process as a historically textured format of design activity. I will look at three strands of design processes.

3.1.1 BRIDGING PROBLEM AND SOLUTION

One distinctive strand of design deals with the bridging of understanding of a user problem and finding a solution for it. Designers claim that they are trained to centre the user in this quest of

understanding and solving the users' problems. This strand of design deals with the bridging of understanding and solving a problem, or with analysing and synthesising information.

Human-centred design is represented as a design process which seeks to centre user needs within production processes (Maguire, 2001). It is defined in an international standard, describing the design process as a cycling through understanding and production activities – "understanding and specifying the context of use," "specifying the user requirements," "producing design solutions" and "evaluating the design" (International Organization for Standardization, 2010). Similarly, in User experience design activities are described as "analysis," "design," "implementation" and "deployment" (UXPA, 2018). It is argued that analysing user needs before making the product, significantly increases the possibilities of success (Cooper, 2004; Norman, 1988*).

The efforts of systematising the human-centred design process, as a stepped process of "understanding," "specifying," "producing" and "evaluating" (International Organization for Standardization, 2010), can be traced back to Design Methodology which was a movement in the 1960s (Gericke & Blessing, 2012). Design methodology comprises of "analysis," "synthesis" and "evaluation" and is proposed to bridge the gap "between logical analysis and creative thought" (Jones, 1963, pp. 10-11). In a seminal work it is described how the design process functions as a "methodical assembly of partial solutions" through "1. Analysis," "2. Synthesis" and "3. Evaluation" (Jones, 1963, p. 11). The theme of understanding a problem before solving the problem is also picked up in the representation of the "Double Diamond," a design process postulated by the Design Council (2015b).

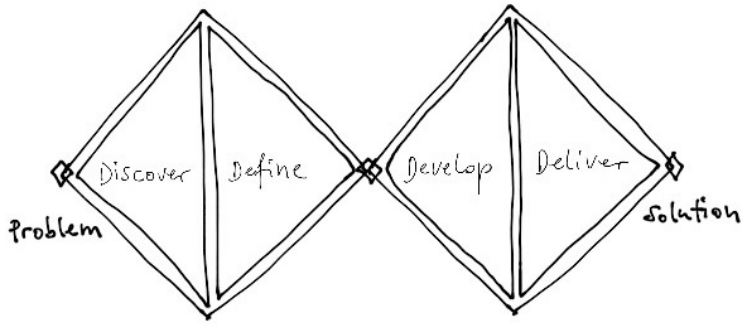


Figure 11: The Double Diamond design process, by Design Council, retraced

> *"Divided into four distinct phases – Discover, Define, Develop and Deliver – the Double Diamond is a simple visual map of the design process. In all creative processes a number of possible ideas are created ('divergent thinking') before refining and narrowing down to the best idea ('convergent thinking'), and this can be represented by a diamond shape. But the Double Diamond indicates that this happens twice – once to confirm the problem definition and once to create the solution. One of the greatest mistakes is to omit the left-hand diamond and end up solving the wrong problem. […] The creative process is complicated, making it difficult to capture simply, but this sort of explanation can at least help make it appear a little less mysterious." (Design Council, 2015b)*

The first part of the diagram is postulated as defining the problem-space, before defining in the second part the solution-space. The Design Council says that the problem-space needs to be defined before the solution-space, in order to avoid "solving the wrong problem" (Design Council, 2015b).

In the book *About face* (Cooper et al., 2007)*, the design process is described as a "goal-directed design process," capable of "bridging the gap" between research and design (p. 18)*. The design process is embedded in an overall development process made up of "initiate" (the responsibility of managers), "design" (a design process), "build," "test," and "ship" (pp. 17-26)*. The design process during the "design" stages is made up of the following steps:

1. Research: Define project goals, review existing work, understand product vision, understand user needs
2. Modelling: define user and customer archetypes, define workflows
3. Requirements: Tell stories about ideal user experiences, describe necessary capabilities of the products
4. Framework: Define functionality, structure and interactions
5. Refinement: Detailed design

6. Support: Accommodate new constraints, maintain conceptual integrity of the design under changing technology constraints

(Cooper et al., 2007, p. 24, extracted quotes from the original figure to give the essential meaning)*

This process describes a separation between *design*, done by designers, and *build*, done by engineers. *Design* produces a detailed specification document, which should serve the engineers as a blueprint. This design process description separates thinking (researching and designing) and doing (building), and it also lifts design into the privileged status of thinking, and hence defining what the engineers implement. Design processes are often disconnected from other organisational processes, such as the implementation of designs (Gericke & Blessing, 2012, p. 178).

The book *Mental models* (Young, 2008)* describes the definition of diagrams, visualising the conceptual understandings of different groups of people, and what they do, as "task-based audience segments." These are then mapped to the proposed functions of the product. According to this design process, assessing the mental model of users can ensure that the product features fit what the users need. Again, in this process, *design* defines what will be built.

Garrett's book *The elements of user experience* (Garrett, 2011)* describes the design process made up of "planes" from "strategy" at the bottom and "surface" at the top. More and more "constraints" arise along the process, moving from the strategy towards the surface. Garrett likens these constraints to those of building a house, where during laying down the foundation more decisions can be made, than when reaching the work on the roof (p. 22)*. For Garrett, this means that once the product is designed and planned, the concrete building of the product can only mould into this already defined shape.

Design is described as capable of bridging analysis (understanding a problem) and synthesis (solving a problem). At the same time, it represents a separation between thinking and doing, in which design is responsible for the thinking part. There are chronologically separated steps of understanding a problem and creating a solution, and at the same time of conceiving of the solution and of building the solution. There is an understanding of constraint which is tied to the chronology

of activities, such as that defining a design before building the design creates a constraint for the building activity. Thinking is thus reproduced as the freer of the two.

To conclude the review of user-centred design against the backdrop of the image of design as an integrative hub, design is here represented as the one-stop shop of understanding and solving a problem for the user. However, there are doubts that these depictions of the design process are based on helpful theoretical models of designerly action. Rittel and Webber, who are usually quoted on their elaborations on the "wicked" nature of design problems, have been severe critics of the textbook understandings of design action as separate steps of understanding and solving a problem:

> *"Every textbook of systems engineering starts with an enumeration of these phases: 'understand the problems or the mission, gather information, analyze information, synthesize information and wait for the creative leap, work out solution,' or the like. For wicked problems, however, this type of scheme does not work. One cannot understand the problem without knowing about its context; one cannot meaningfully search for information without the orientation of a solution concept; one cannot first understand, then solve." (Rittel & Webber, 1973, p. 162)*

Practice studies have found that design activity doesn't follow particular steps. For example, a study of architectural designing has shown there to be no distinct steps of analysis and synthesis, but that both ways of knowing can be found in all activities (Gedenryd, 1998). Furthermore, the representation of design as a key contributor to the *thinking* part of the dyad thinking and doing, while the *doing* part is given to others, reinforces an unhelpful separation between thinking and doing, and as such ignores the opportunities to reconceptualise design, and to perceive "embodiment and being in the world [as the] condition of knowing and action" (Kimbell, 2011, p. 298).

3.1.2 OVERCOMING THE DESIGN AND IMPLEMENTATION DIVIDE

Against the isolation and separation of design from implementation which is prevalent in accounts of design (Gericke & Blessing, 2012), there is the Lean and Agile movement which seeks to overcome this separation of analysis and synthesis by making rapid iterations between designing and building towards what is needed by customers (Fox, Sillito, & Maurer, 2008; Mueller & Thoring, 2012). Making is here emphasised over analysing (K. Beck et al., 2001). In human-centred design, these

efforts emerged as design processes, such as Lean UX. Designing is here "learning", and building and learning are here wrapped up in cycles of testing ideas (Gothelf & Seiden, 2013)* in "Build-Measure-Learn feedback loops" (Ries, 2011, p. 75).

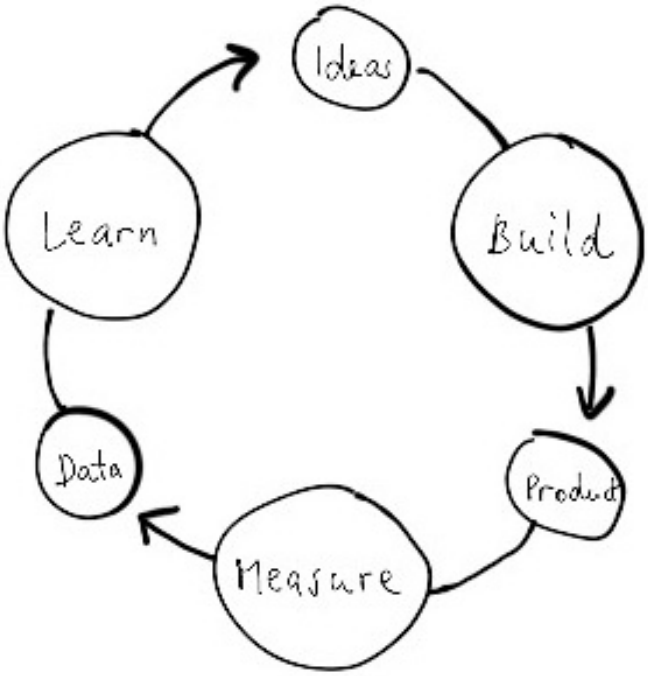


Figure 12: Build-Measure-Learn Feedback Loop by Riess, 2011, p. 75, retraced

The rapidly cycling approach of Lean and Agile is a counter-movement to the slower, linear Waterfall process, where each phase of a project requires approval before it *falls* into the next phase (Unger & Chandler, 2009, p. 63)*. Where in traditional user-centred design processes the emphasis is on a linear *understanding the user* before *building* and then *evaluating*, in Lean and Agile processes the emphasis is on *building* a solution before *measuring* if it solved the problem, and *learning* how it could be improved. A key concept is here a minimum viable product (MVP) which allows testing the value and effect of a proposition with a minimal production effort, before iteratively building it up to a full product or service.

Lean UX is based on the philosophy that people make assumptions all the time but are not explicit about them, and that the production process would benefit from an open, collaborative dialogue on

making assumptions explicit and testing them straight away (Gothelf & Seiden, 2013, p. 18)*. In the Lean UX cycle, which follows the steps (1) "Declare Assumptions," (2) "Create an MVP," (3) "Run an Experiment" and (4) "Feedback and Research," assumptions are made explicit, and continuously tested as hypotheses. User stories are an important ingredient of this approach of designing. User stories originate in Agile software development, and they are used to represent an assumption about a user need (Patton, 2014, pp. 97-108). There is a "story template" which goes like this: "As a (type of user) I want to (do something) so that I can (get some benefit)." For example, "As a band manager, I want to upload an image so that I can customise my promo flyer." A blog post by a practitioner gives examples of how experiments can be run with even greater precision to give more detailed information about how users experience and react to design changes (see Wambach, 2015). The designer in this post points out that change in a layout can have many dimensions and affect the amount and density of content, the structure, and the prioritisation of information, like making some elements more stand out. In this blog post, the designer suggests how parts of a designerly hypothesis can be made explicit and tested. He proposes the following formula: "If (action) then (outcome) because (customer need/problem)," or in these two examples: "If we provide more listings on the screen then we can provide better comparability and offer more diversity on our platform because users like to compare a lot of listings on the result page," or "If we provide more structure to our listings then we achieve a better scanability because the user is able to scan the relevant information quicker."

Also Value Proposition Design, which uses an approach called Business Model Canvas adopts the Lean Startup *build-measure-learn*, as well as the *technology-business-human* triad (Osterwalder et al., 2014). Another approach, Design Sprint (Knapp et al., 2016)*, postulates a short 5-day process, an initiative from Google Ventures.

> Monday: "Map out the problem",
>
> Tuesday: "Sketch competing solutions",
>
> Wednesday: "Make difficult decisions and turn […] ideas into a testable hypothesis",
>
> Thursday: "Hammer out a realistic prototype",

> Friday: "Test it with real live humans"
>
> (Knapp et al., 2016, p. 16)*

An important feature of this strand in design is the attempted overcoming of the separation of *design* and *implementation*, or thinking and doing, by learning through doing. In this orientation of design, design processes begin with ideas or concepts, and the quick iterations of testing and improving those concepts. The most significant trait of Lean and Agile processes is the rapid cycling between design and implementation as a learning process.

3.1.3 DESIGN THINKING AND INTERDISCIPLINARY THINKING

Another strand in design speaks of design as the integration of individual and team goals, and of subjective and the objective ways of knowing. These point towards a new representation and use of design ability.

In human-centred design, there has been a move towards conceptualising the *social* of interaction (McCarthy & Wright, 2004b; Wright et al., 2006; Wright et al., 2003). With the rising interest in human experience in interaction (Desmet & Hekkert, 2007; Kuniavsky, 2007; Norman, 2004*; Schifferstein & Hekkert, 2011), there have been efforts to extend the theorising of the human-technology interface towards *context* and the wider social environment of interaction (Kuutti, 2009; Kuutti & Bannon, 2014). "Experience" is conceptualized to be produced by the user's body in interaction with the product, such as a "mountain bike", amid its material environment, such as "the mud, rocks, sticks and yes, the water" (Buxton, 2007, pp. 98-100).

> *"Not the physical entity or what is in the box (the material product) […] is the true outcome of the design. Rather, it is the behavioural, experiential, and emotional responses that come about as a result of its existence and its use in the real world" (Buxton, 2007, p. 10).*

Personal experience is seen as the *subjective* responses, which result from the interaction with the *real* and *objective* material. The world is seen as an *objective* set of conditions, while humans are conceptualized as *subjective*. Hassenzahl (2010) outlines the "objective condition" to be elements such as the buttons on a device, or time, whilst the "subjective experience" relates to concepts such as

beauty, or satisfaction (pp. 9-11). Amongst scholars there is a theoretical interest in solving the dynamic of the unfolding of interaction which involves these supposedly objective materials and subjective experiences. For example, there is an attempt to sketch experience as the grade of fulfilment of "psychological needs," such as "autonomy," "competence," and "relatedness" (Hassenzahl, Diefenbach, & Göritz, 2010, p. 354). However, despite these detailed accounts of describing the role of experience in human-technology interaction, human-centred design theorists admit that there is much to unearth about the "transformation rules" that turn objective conditions into a subjective experience (Hassenzahl, 2010, p. 11).

Despite the focus on social context in the production of user experience, relationships such as between the user and the designer are hardly touched on. A lot of the attention rests on the agency and ability of the individual designer in creating these user experiences. The personal attribute of creativity is seen as an important ingredient of innovation (Dorst & Cross, 2001), and being able to transforming ideas into possible solutions (Hargadon, 1996). A designer's ability to design is described as particular "designerly ways of knowing" (Cross, 1982, 2011) as "forms of knowledge special to the awareness and ability of a designer" (Cross, 2001, p. 54). As designerly knowing was taken up by business innovation in Design Thinking, the concept of the *ability to design* was merely extended from the individual capacity towards collaborative action (Dorst, 2011). Design ability has so been exported from design practice to the mainstream of running organisations (Stewart, 2011).

Due to the individual conceptualisation of design ability, the translation of design into fields outside of design has come with theoretical issues. Because designerly knowing has been described as "tacit" and as difficult to "externalize" (Cross, 1982), there are continuous attempts to find better ways of access. For example, there have been attempts of externalising design knowledge through getting designers to work in groups and to analyse the conversation protocol, or to get designers to think aloud (Cramer-Petersen, Christensen, & Ahmed-Kristensen, 2019; Cross, Christiaans, & Dorst, 1996; Cross & Clayburn Cross, 1995; Lloyd & Scott, 1994). Design knowledge is here seen as a cognitive skill (Lawson & Dorst, 2009), which takes place "in the head" of the designer (Kolko, 2010a, p. 15). Drawing has sometimes been described as the expression of the designerly mental cache (Buxton, 2007; Lawson & Dorst, 2009).

Designerly knowing has often been conceptualised as the designer's individual sense-making through abductive reasoning (Cross, 2011; Dorst, 2015; Kolko, 2010a; Martin, 2009). The subjective experience is understood to be critical in creative sense-making, whereby this is based on conceptualisations of experience as an individual capacity (Csikszentmihalyi, 2014). Kolko (2010a) describes designerly sense-making as the synthesizing of the designer's objective knowledge, such as empirical observations, with the designer's subjective knowledge, such as personal experiences. Lloyd and Snelders (2003) conducted an analysis of designer Philippe Starck's work, illustrating how subjective experiences impact design situations. When exploring the designer's conceiving of the futuristic alien-squid-like lemon squeezer, Juicy Salif, the authors trace the familiar elements which may have served Starck as a source in his design, such as his father's work in aeronautic design, Starck's teenage interest in science fiction cartoons and space flight, each tied to a particular visual language, as well as the significance of the locality where he did his first sketches – a fish restaurant serving baby squid. Designerly knowing is so described as a designer's personal capacity.

Designerly knowing is understood as internal to the designer, and subjective knowing is part of the concept. The concept of designerly knowing relies on the designer to be the medium of this internal process which is hidden from view. As this tacit process, design ability is represented as available to the designer only. This narrative plays on the old notion of the designer genius (Fisher, 1997). It is consistent with romantic explanations of design understood to be reliant on the designer's subjectivity. Designers report being "dependent on 'inspiration': An idea about [X] 'popped' into my head", keeping the creative process "shrouded in mystery" (Coyne, Snodgrass, & Martin, 1994, pp. 116-117). On the one hand, there are attempts of making the design process "appear a little less mysterious" (Design Council, 2015b), while on the other, it is *made* mysterious by representing it as hidden from view (Coyne & Snodgrass, 1991).

In the meantime, Design Thinking continues its efforts to make design ability more transparent and visible. It conceptualises design as capable of mediating different kinds of expertise, and to reconcile different types of reasoning. "The creative process […] relies on synthesis, the collective act of putting the pieces together to create whole ideas" (Brown, 2009, p. 69). The "two modes of thought [, …] analytical thinking [, and] intuitive thinking, the art of knowing without reasoning" (Martin, 2009) are reconciled in an embracing of the creative and the logical (Brown, 2009).

Design Thinking may be a taking-the-bull-by-the-horns response to the criticism of design as a process of designer genius, whilst at the same time not giving in to the alternative conception that anyone could design. "Design by committee" is the horror phrase of design practice, as the results would be bland and anything other than "great" (Norman, 2004, p. 98)*. Design Thinking, instead, is represented as the perfect mix of individual greatness with collective inclusion. Brown (2009) describes the extraordinary "design thinker" as someone who possesses a "depth of skill" in at least one field, who at the same time is able to span across several disciplines.

> *"In the end, this ability is what distinguishes the merely multidisciplinary team from a truly interdisciplinary one. In a multidisciplinary team each individual becomes an advocate for his or her own technical specialty and the project becomes a protracted negotiation among them, likely resulting in a grey compromise. In an interdisciplinary team there is collective ownership of ideas and everybody takes responsibility for them." Brown (2009, p. 27)*

This "truly interdisciplinary" capacity is visualized by the design innovation diagram by IDEO (Brown, 2008; IDEO U, 2019). Here, technical "feasibility" is intersected with economic "viability", and "desirability" from a "human point of view" (IDEO U, 2019) – a triad of technology-business-human.

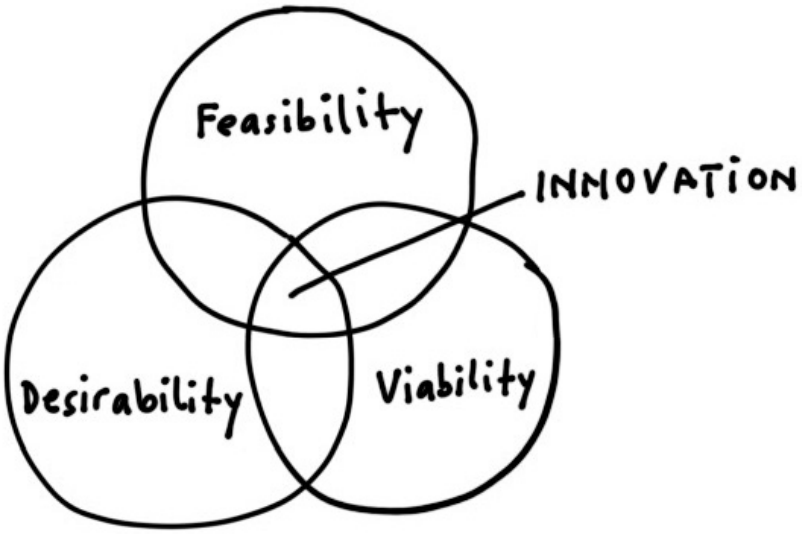


Figure 13: Design innovation, by IDEO U, retraced

> *"Thinking like a designer can transform the way organizations develop products, services, processes, and strategy. This approach, which IDEO calls design thinking, brings together what is desirable from a human point of view with what is technologically feasible and economically viable. It also allows people who aren't trained as designers to use creative tools to address a vast range of challenges." (IDEO U, 2019)*

Also in the book *About face* (Cooper et al., 2007)*, the triad of capability, viability, and desirability, which is attributed to Larry Keeley (p. 11)*, is described to constitute the different domains in the production process. The capability of the design process is here described as a process of *accountability*, providing a "clear rationale for design decisions, [that] makes collaboration with developers, business people easier, and ensures that the design in question isn't guesswork, the whim of a creative mind, or just a reflection of the team members' personal preferences" (p. 25)*. Design is here understood as a "powerful tool" to bring together different interests, providing the outcome of a "clear rationale for design decisions" which is not guesswork, not a whim, and not a personal preference (p. 25)*.

Also the book *A project guide to UX design* (Unger & Chandler, 2009)* speaks about "tech possibilities", "user needs" and "business needs" that should be ideally equally balanced in product the development process and invites to readers "picture this as a three-way tug-of-war" (pp. 154-155)*. This balance being disturbed can lead to "a costly or buggy solution that meets business requirements but misses user needs," "a costly or buggy solution that meets user needs but does not generate revenue for the company," or "an inexpensive or high-quality solution that may work well but does not meet business or user needs" (p. 155)*. Design Thinking is represented as the particular ability to be a "hub" (Brown, 2009, p. 5) in which different knowledge domains (technology, business, human values) and different ways of knowing (logical and intuitive) can be integrated and mediated. As a hub, design is the centre of all parts.

Through this integration and mediation, design is said to not only produce solutions to problems but even to reframe problems for the production of answers to previously unknown problems. Dorst (2015) describes how problems can be framed in different ways through which designers can achieve new visibility on the desired outcomes. He describes how designers create frames between aspired

values and possible working principles. He uses as an example, the brewing of coffee in the morning (working principle) as delivering a rush of energy (value).

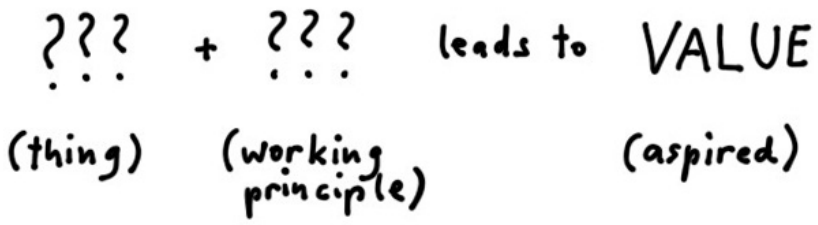


Figure 14: Framing problems, by Dorst, retraced

He redefines the "value" as "being able to concentrate," in which case a possible working principle may not be "brewing coffee, but meditating to get a clear mind" (Dorst, 2015, p. 49). In contrast to the methods derived from the 1960s' design methodology, design thinking does not restrict itself to a careful moving from problem-space to solution-space, but claims for itself a flexibility to jump flexibly between both, and to even be in both places at the same time.

In this strand of design, design is proposing itself as the centre and as the hub of innovative thinking and able to overcome individual and team interests, as well as subjective and objective ways of knowing. Design is here represented as able to integrate different types of knowing and different interests. The IDEO design innovation diagram shows this integration as an overlapping area where spheres of interests come together. This coming together, this integration, is what is promised to make the special capability of design, required in human-centred innovation.

3.1.4 THE DESIGN PROCESS AS A HOLISTIC DEVICE

I propose that there are similarities across all these strands of design. Most significant about the appearance of these representations of design activity is the particular format of a *process*, in which several entities hang together, implying a distinctness of these entities. The representation of entities within the design process, as steps or as knowledge domains, is different in each strand of design, and often within each representation (Bobbe, Krzywinski, & Woelfel, 2016; Gericke & Blessing, 2012; Howard, Culley, & Dekoninck, 2008; Mueller & Thoring, 2012; Wynn & Clarkson, 2005, 2018).

In the strand "3.1.1 Bridging problem and solution," the entities are A) analysis and understanding of a problem, and B) synthesis, or solving the problem. This strand also uses the notion of A) thinking, strategizing, and B) doing, implementing. Such representations fit with the traditional splitting of the world into theory (A) and practice (B).

In the strand "3.1.2 Overcoming the design and implementation divide," the problem of this separation has been noticed and was sought to be rectified in an iterative, rapid cycling between A) thinking, or measuring, and B) doing, or building, in order to generate learning which can be increased with each cycle.

In the strand "3.1.3 Design thinking and interdisciplinary thinking," the entities represented are A) objective, logical thinking, and B) subjective, intuitive knowing. This utilises yet another dimension of representation, by representing itself as the overcoming of A) collective goals and B) individual goals – in collaborative ways of working.

What all the design process models have in common is that they mediate different types of entities and different ways of knowing. These different entities are located and related within the process. While these locations are partial, in the representation, the design process in which they are integrated makes up the whole. Design as a human-centred methodology of innovation is represented as capable of making partial things whole.

As I was able to introduce, there are many ways of explaining how design activity unfolds, and the key theme is the design process as a methodological device making whole what would otherwise remain partial. Design is depicted as a human-centred methodology which can, in the form of the design process, as a system of methods, produce innovative outcomes. Design is represented as a device capable of mediating, synthesising and ordering different interests and different types of knowing (subjective, objective, intuitive, logical, individual, collective). Furthermore, loyalties are here settled in the stand-off between humans and technology in innovation, as design to work in the favour of the humans.

3.2 THE DESIGNERS AT WORK

3.2.1 THE HUMAN-CENTRED PRODUCTION TEAM

Along with the processes which are described in design, the designers are understood as the key protagonists of design. They are, however, understood to rely on the relationships with others in the user-centred production team. The design process is not only understood to structure activities, but also to order the relations between people, skills and responsibilities. I reviewed the designer library to identify the following roles and responsibilities (Allen & Chudley, 2012, pp. 40-44*; Cooper et al., 2007, p. 6*; Garrett, 2011, pp. 52-54*; Gothelf & Seiden, 2013, pp. 121-122*; Knapp et al., 2016, p. 33*; Unger & Chandler, 2009, pp. 21-31*).

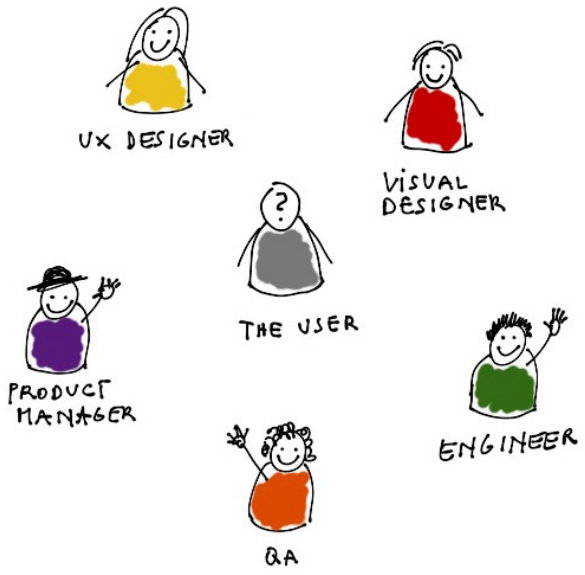


Figure 15: The schema of a user-centred team in product development

Engineers: Key persons which designers work with are the *engineers*. The engineers are also called *developers* or *programmers*. They code the software or the interface. Occasionally the engineers are sub-divided into *front-end developers* or *backend-developers*.

Designers: Designers are called *UX designer*, *interaction designer*, and sometimes *information architect*. They are very often named separately to *visual designers*. UX designers are sometimes split between *designers* and *researchers*.

Managers: The *product managers* or *product owners* hold the commercial vision of the product. This function could also be carried out by a *business analyst* as the "primary liaison between business stakeholders and the technology team" (Unger & Chandler, 2009, p. 27)*.

QA: Quality assurance (QA) are team members who test whether an implemented feature conforms with its design specification. *QA* are called just that (Cooper et al., 2007, p. 6*; Gothelf & Seiden, 2013, p. 122*). They do not have a personified title, which may be an expression of the objectified emphasis of their role in ensuring the objectivity of tests.

The user: The user is not a role within the team. *The user* is a mere placeholder for people who use the products and services. The user is often named as such, as the situation of use is what everything is supposed to be centred upon in human-centred design. As a placeholder, the user is represented in a number of artefacts. Users are subject to the research of the design process and are, as a result of the research, then represented as various artefacts:

- Personas, in a snapshot of who uses the product (Cooper et al., 2007, pp. 77-88)*
- Mental models, as a map of connected concepts around an activity (Young, 2008)*.
- Scenarios, as a narrative form of telling about the need of a product (Cooper et al., 2007, pp. 109-113)*
- User journeys, as the modelling of how a product will be used (Allen & Chudley, 2012, pp. 173-186)*
- Experience maps, as the visualisation of how a product fits into a user's everyday experience (Allen & Chudley, 2012, p. 189)*

Users may also be called customers, clients, patients, citizens, audience, or the market, depending on the different contexts of production.

Within the design team representations, a schema emerges from the literature about how a user-centred team looks, despite slight differences and different names. I have represented this schema in Figure 15. Several other roles, for example, search engine optimisation (SEO) experts, subject matter

experts, and content specialists were named, too, but not often enough to be included in the starting lineup.

I will briefly delve into the topic of *the user*, as it is such an important concept in human-centred design. The user is not a real person, but instead a placeholder for how the product will be used. The user is represented as a concept. Teams seek to build this concept based on the real people who use their products and services, and therefore, user research is conducted to get to know the situations of use. A range of qualitative and quantitative methods are employed to create an understanding of use and the people who use the product within production teams (Cooper et al., 2007, pp. 49-72)*. The results of the research will be represented in artefacts that will be present on the production site. Richard, a design manager, describes to me how his team uses "formative" and "summative" tools related to the user.

> *"'Formative' are tools that we would use to help us understand, so form an idea, and so that could be 'interviews,' it could be 'analysis of data,' it could be 'diary studies,' 'contextual enquiry,' they're user research tools, or it could be 'usability evaluation,' it could be 'competitive analysis,' you know, these are tools to help the team inform their understanding. And then 'summative' tools would be tools that allow us to communicate what we've learnt to others; so it could be things like 'personas,' or it could be 'user journeys' or 'customer journey maps,' 'experience maps,' […]" (Richard)*

To explain one important method in more detail, *personas* represent groups of users with similar needs. The method of personas is meant to make design decisions simpler, by focusing only on particular groups of users and caring for their requirements well, rather than focusing on all needs and ending up with a feature-rich but unusable product (Cooper et al., 2007, pp. 77-88)*. There are many descriptions of the personas method, but Cooper is credited with its origin. However, his description seems decidedly stereotypical, showing example personas for three different types of people purchasing a car: The woman prefers safety, the dark-skinned guy likes fun, while the light-skinned guy requires reliability (p. 78)*. However, personas are not used so widely anymore; they are often seen as dead weight – created but never looked at again (Patton, 2014, p. 185), and designers have come to conclusions about faring better when focusing on people's goals, rather than their traits, because "making crucial decisions based around a series of personality traits won't get you

there" (Intercom Inc., 2016, unpaged). *Proto-Personas* is an approach in Lean UX, in which personas grow with the product; initially they consist only of a rough sketch of the user and what he or she is trying to accomplish, and as the product grows, the team anticipates getting to know the user better through seeing the product in use (Gothelf & Seiden, 2013, pp. 26-29)*.

Another special position is that of the designer. The relationship of the designer with the team might be viewed as slightly awkward, as the methodology proposed is a design process, while only a few of the team members are designers. Furthermore, the designer is often made responsible for the user research, for representing the user, and for bringing the user into the production process.

The designer and the user hold particular places in the process, which will be the subject of the following chapters. It will become clearer how designers participate in the human-centred design process involving a whole production team within digital innovation practices. And it will become clearer what it means to centre the user.

3.2.2 TRAINING AND EDUCATION

Designers in digital innovation have diverse backgrounds. Not all the designers in the field have an original background in design. Some have other backgrounds, such as "human-computer interaction (HCI), information design or psychology […] computer science, project management, journalism, fine arts, library science, or business" (UXPA, 2018), as do some of the participants in this research. The designers also do not always have university degrees; they sometimes attended "courses towards certification" (UXPA, 2018). There are several well-known organisations which provide training for designers in the field. Rosenfeld Media, for example, which is the publisher of five of the 21 books in the designer library, also provides training events and conferences for design practitioners in digital innovation. I am going to review some of the online sites, events and training courses available. One of the well-known conferences on human-centred design in digital innovation, for example, is the UX London, an annual U.K. conference.

Figure 16: UX London 2018

At UX London participants can "learn from the authors, founders, directors and designers who are helping shape the industry and push it forward." The conference website advertises the next conference, as well as showing images of the venue, the conference, and of the "influential" speakers. It also quotes previous speakers, such as Josh Seiden, who co-authored the book *Lean UX* (in the designer library). He is quoted saying, "UX London is special to me because the programme that the team puts together always tells a great story and I learn so much when I come here." The imagery shows the conference crowd, and the speakers on stage, as well as images of a workshop activity with sketching. (Clearleft Ltd, 2018)

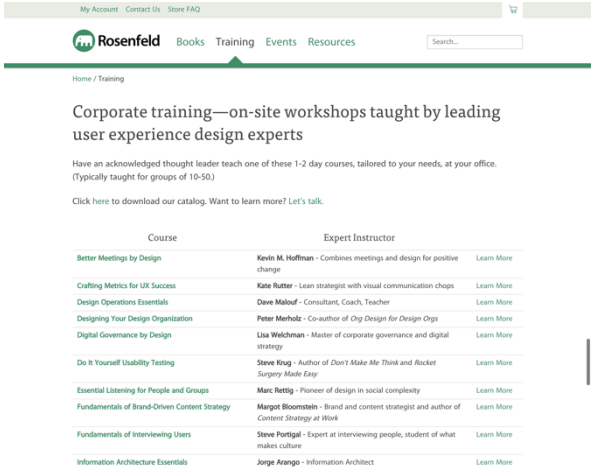


Figure 17: Rosenfeld Media training

Rosenfeld Media is a United States book publisher in the field of information architecture and UX, who also offers corporate training. Some of their expert instructors are authors of books the house has published in the past. Indi Young, the author of the books *Mental models* and *Practical empathy*, for example, teaches a course on "Mental models for better decision-making." (Rosenfeld Media, 2018)

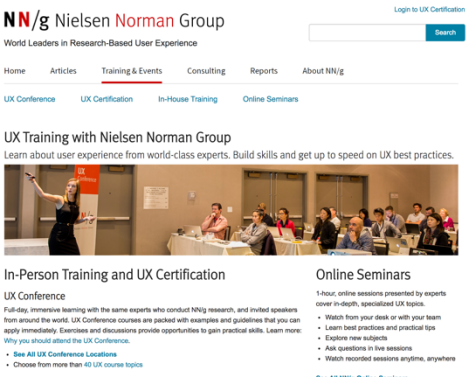


Figure 18: Nngroup training

The Nielsen Norman Group runs a well-known website which designers use as a resource for their daily work. The website contains existing research about how people use websites and other digital media and gives advice on how to design components for digital media. The organization also run training courses and conferences nationally in the United States and internationally, for example, in London. (Nielsen Norman Group, 2018)

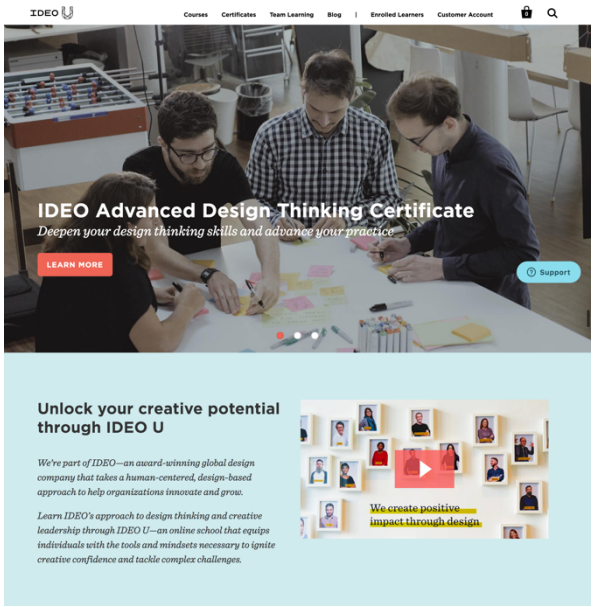


Figure 19: IDEO U training

IDEO is a leading United States design consultancy firm around which many books were published, such as *Change by design* by Tim Brown and *The art of innovation* by Tom Kelley and Jonathan Littman. IDEO U is IDEO's "online school," and offers training and certificates in the "foundations in design thinking" and in "advanced design thinking". The "human-centered, design-based" approach to innovation is emphasised, along with the prospect that creativity can be "ignited" in anyone participating. Imagery shows people at work together at a table, with Sharpie pens and Post-it Notes. (IDEO U, 2019)

Figure 20: Stanford d.school training

> Stanford d.school, also called the Hasso Plattner Institute of Design at Stanford University, offers "a virtual crash course" in design thinking. Imagery again shows Sharpie pens and Post-it Notes, along with coloured tape. Noticeable is the first image: Two men, riding and balancing on a bike in the design studio, as if in the middle of an acrobatic exercise. The course organisers "hope you will take away some of the basic principles of design thinking and start to adapt them into your personal and professional routines." (Hasso Plattner Institute of Design at Stanford University, 2018)

There are many more training events, conferences and publishers. The ones mentioned here are only some of the most well-known. From the images, it is visible that these events are about people coming together, and individual people on stages who share their "stories" as Josh Seiden said. Some of these people sharing their experience are well-known names, such as Seiden and Young, who are authors of widely read books. The theme of creativity and making is dominant – there are hands on tabletops with materials such as pens, paper and Post-it Notes – writing and sketching. The theme of artistry is clearly present on the d.school website, where two men cycle acrobatically through the studio. This image emphasises the bodily involvement in creativity and design.

3.2.3 USING THE DESIGN PROCESS AS A STRUCTURAL GUIDANCE

Design processes and their methodology of human-centred design are important guidance in the designers' everyday work. Gerald, a UI designer, tells me, "I believe in user-centred design, that you [as a designer] can only give your best guess but it's when you show it to people [that] you actually start learning about what the product is really about." And Richard, a design manager, says that the user-centred design process is important for "not just designers actually but even stakeholders" as there are many people involved in the production of goods and services. The human-centred design process is viewed as a good structure to guide innovation work in general. Miriam, the manager of a design team, tells me how she came to devise the "ways of working" in her organisation's department from the ground up:

> *"When I came in here a year ago there weren't any [processes] when I got here there wasn't even a, 'Here's the logo,' you know, and when you're doing some presentations and materials there wasn't a template for anything, there wasn't even a place to put your files, there was no structure at all. So, they had to literally get everything off the ground […] 'Okay, what do we need?' So, I started to look around, and I was like, 'Pretty much everything!' […] and I went, 'Well, ways of working, the [4 stages of the design process] for example, they're quite famous' and they were like, 'What's that!?' So, I walked them through that […] and just pulling stuff together, that is from good practice that's around anyway in the design field, it's not made-up. […] you need to educate them or teach them and take them on those kind of journeys, so that we're all talking the same language […] we all need to be a team that understands the same process; that we are working in this together, and we're understanding what that journey is and then having a visual, you know, you're able to walk past it every day, you're able to have that conversation […]" (Miriam)*

Miriam talks about the design process that she developed, based on "good practice" in the "design field". She talks about the importance of bringing everyone together as a team in the design process. Miriam expects the design process to help her create a "structure" for the design work. In her organisation, the design process was printed out large and visible on the wall – visible to everyone, as

they are "walk[ing] past it every day." And in a different organisation, Richard describes to me his affinity for the Double Diamond design process:

> *"The Double Diamond model is a model that I think underpins my personal beliefs around how design thrives, if you like. […] at a very high level I would say the second of those diamonds relates to 'solutions' and the first diamond relates to 'problems' […]" (Richard)*

Richard adheres to the description by the Design Council. He points out that the design process models are not necessarily a reflection of the activity, but that they are useful to give context to activities.

> *"These are all models, so by their very nature they're not right, you know, they're just useful for framing things but to give context to this in a very broad perspective, I'd say, yeah, if you're in the second diamond then you have reached 'problem definition'; you have an understanding of the context within which you're working, you understand, in terms of user experience, what needs you're trying to fulfil, or what problems you're trying to solve, and you may go on a divergent process then to try and explore different solutions but eventually you'll then refine down. The first diamond is about taking the same kind of thinking but applying it to understanding the problem. […]" (Richard)*

Richard describes how designers in the "second diamond" will already be restricted by the problem, which was defined in the "first diamond." So, although he sees the design process model as an orientation only, he shows in what ways he expects it to constrain designers in action. The design process appears to be like a shaping mechanism for design action to ensure a "human-centred" outcome.

> *"So, I think human-centred design is about understanding that there's a process that we can go through to reach that mindset and that we need to allow designers that we're working with, and not just designers actually but even stakeholders, to go through some of that process. So, a lot of our tools will be about trying to build formative tools that allow the team to understand that level of fidelity but then also, summative tools that allow us to communicate that to others as well, so that we can go into a client and say,*

'This is what we believe your user is actually looking to achieve and we believe if we help them achieve that then it's going to drive some sort of value for your organisation,' it could be financial, or loyalty or something like that. So, yeah, I think that [it is] about trying to allow designers to go on to trust the process and understand that they're going to come out the other end with this human-centred perspective on the problem that they're to solve and then their job is to be the evangelist for that, you know, to make sure that the project, the product, retains that at its core." (Richard)

Richard says that user-centred design is a process which one can go "through." It is a process, made up of steps of "formative" activities (which he later defines as "thinking") and "summative" activities (as "making"). Richard splits the thinking and the making, according to the postulations of the design strand emphasising the bridging of problem and solution.

Both designers, Richard and Miriam, tell me that the design process has a constraining and an enabling ability for the working activities. Miriam speaks about the "structure" which "logos", "templates" and "places" to put files, as part of the process, would create. In their words, the design process is supposed to facilitate and shape activities by giving them structural guidance.

3.2.4 THE DIFFICULT TO ACCESS USER

However, I am going to show, the design process is a very remote reminder of how things are supposed to be for the designers' everyday work. For example, the designers find it is not easy to gain user-information. Jack, a UX designer, explains to me that it is a very slow process to get access to users outside of the company. There is a "two week turn around on speaking with members of the public," he says, because an external company needs to be tasked with recruiting those users. This does not fit well with methodologies like Design Sprint, which Jack's design team currently uses. In the Design Sprint, user testing is a brief activity at the end of a very tightly looped design activity. A Design Sprint lasts five days, and the testing happens on the 5th day. If it takes two weeks to recruit test users, but they are needed within a week, user testing will be difficult to organise. For the same reason, Gerald describes how users for user tests are recruited internally, which is difficult because "it is often people with technical knowledge and often knowledge of the project itself, which I think kind of invalidates all the feedback entirely." Also, Noah, a designer in a small software company, tells me that the users of their product are employees of companies trained in using the product, so it

is hard to conduct user research with anyone else. User research for him only makes sense with actual customers, as they have the special knowledge required. But a lot of them are CEOs and "people [who] are really important." They are difficult to access and "not sure how receptive they'll be to wearing a camera on their head and testing it for an hour." Another obstacle to user research is described by Lena, a UX designer of a medium size organisation. She explains that their users are spread all over the country. Similar to Noah's case, they are specialised users, and not anyone could take part in the user research. Because the cost of travelling wouldn't be justified, she explains, they usually only speak to users remotely, ie, on the phone.

Lena, however, tells me how important it would be to see their users and to research how they use the software. She tells me that on a recent in-person visit to a customer – a rare one – she had an eye-opening experience.

> *"We went to see a customer recently [and noticed that] there was a particular feature on the platform that they actually felt we had made worse with the new version. So, they were using two systems; they were using our old system and the new one. And they were just using the old system for this one feature that they thought we'd made worse in the newer platform, so for somebody to go to that effort to actually login to a different piece of software just for one feature… And it was a real eye-opener because they showed us all the problems they were having and I guess what [we] thought was aesthetically more pleasing was actually more difficult for them to use because they couldn't see everything on the screen at the same time and, you know, sometimes, in visual design, you think, 'Oh, well, it's much neater that way,' but actually it had a real impact on what they were doing because everything was kind of hidden from view." (Lena)*

Lena has the user-centred design process in mind when she tells me about the experience of having made their software "worse". She is aware that this happened because of not enough face-to-face contact with the users.

David, a UX designer in a large organisation, uses a workaround for the lack of access to users. He explains how he uses colleagues to stand in for the users:

> *"So, they're a group of people who have volunteered to talk to product development groups about new products and services and give their feedback as people rather than as employees with any particular professional … but, inevitably, it's very hard for them to separate their professional lives and when you ask them about '[subject area],' that part of their brain kicks in, you know, professional … but we're able to talk to people in here who don't know very much about our project, so that's been a reasonable proxy for an external person." (David)*

For David, the worry remains that these users are insufficient stand-ins for the actual users, but he has no choice if he wants feedback on the use of the product he has designed. He reinterprets employees as "people" and thus makes do with these converted users.

Not all study participants reported difficulties in accessing users. Johnny, a UX researcher in a large tech organisation, tells me how he normally approaches users by tracking what company they are part of, and who their account manager is, before contacting them:

> *"[…] "So, you look at the user's email address who has done the action and then you can find out what client they're part of by just doing some […] look-up stuff in Excel and then also who owns that account in the account management team and then check with the account manager that you can talk to this person and then, yeah, reach out directly to the user and ask them about the usage of whichever feature." (Johnny)*

But despite Johnny having almost unrestricted contact with the users, he does not always find it easy to speak with them. He tells me about issues when users "don't speak English very well," or if "there's issues around billing, like if they haven't paid in a while we're not going to do user interviews with them", or with "interns or junior members of staff" who don't want to speak to him but "just want to carry on and do their job." He also struggles to get people to speak with him if the product is not a "sexy product to talk about" but just an everyday tool. Furthermore, the people he is able to contact are not necessarily the people who use the product, but those who purchased the product. The people who bought the product are more invested in speaking with him because they need to prove they made a useful investment:

> *"[The people who want to talk] are typically the heads of the team who are using the product, or the people who have bought the product and then the rest of the team are using it, that sort of thing, and those sorts of people, they're invested, like their name is on the line in terms of using [product] and in terms of proving that [product] is useful […]" (Johnny)*

Johnny doesn't find it easy to speak with all users, even though he is able to contact them.

Anthony is plagued by another issue. When he is planning his user research session, he is surprised about the "address" field in the non-disclosure agreement (NDA,) which his research participants need to sign. He finds the idea alarming that someone needs a permanent address, and must declare this address, in order to take part in the research. He speaks with his colleague Henry sitting nearby. Anthony questions the standard practice of NDAs, and on the way, the conversation turns into the absurd.

> The conversation turns into a nicely spirited but vivid debate, whether it is necessary to take someone's address. Henry says it is legally necessary to take an address, it is the "legal system in this country," because "how do you sue them if you don't have an address". And "it needs to be a residential address." Anthony replies, but what if someone doesn't have an address. Henry replies, that in this case, you wouldn't use the NDA. Anthony replies, "but what if that person would use the information, even if they were living on the street. What if they are a millionaire?" Henry: "Where is their money? You can't have a bank account without an address." Anthony: "What if they had all their money with them. Or what if they lived in a truck." Henry: "You have to have your truck registered at an address." Anthony: "Or a bike! What if they had a bike with a large [indicating with hands a cargo compartment]." They both laugh. "I don't like someone controlling you, by telling you you have to have an address."

Anthony realises the conditions of the relationship which the organisation strikes here with the research participants. He is not happy about the control which the organisation exerts.

Wilkie (2010) researches how design teams create "user assemblages" for the purpose of aiding their designs. Through case studies, he describes, for example how Ron, a man with diabetes, is used during design meetings to describe "operational aspects of diabetes," despite being classified as a "non-user" due to his non-compliance with the health care plan of the team (pp. 81-109). Wilkie describes how a set of hexagonal cards (he calls them "descriptors") supports the discussion amongst the design team, and nevertheless revealed the only partial representation of the user:

> *"The patterning of descriptors brought into view a partial representation of a patient-user constituted by intravenous drug use, pedagogical forms of blood monitoring and the mundane material reality of medicine consumption. Of course, each descriptor implied further entanglements: for example, contractual relations with healthcare providers supplying medical technologies and services. In other words, each descriptor acted as shorthand for a more extended sociotechnical arrangement. Nevertheless, Ron's identity, local reality and the messiness of his daily routines were expunged from the visual patient-user assemblage that took shape on the meeting room wall." (Wilkie, 2010, p. 96)*

Wilkie describes how Ron is subject to a systematic "de-individualisation" (2010, p. 98) in order to fit the format of the discussion, aided by the descriptors. Clearly, Ron's situation didn't fit what the design team anticipated, neither as a user with routines too messy to count as such nor as a human with a life too unmanageable to fit the small information holes that needed filling within the design process. The designers nevertheless made the material they had collected with Ron fit, by using partial aspects of Ron's life.

Users and organisational processes who neatly slot into the formats of the design process are included in the design process. Those who cannot be accessed are out. Sometimes, *employees* can be converted to *users*. And those who can be accessed are filtered out as those who speak English, are not behind with payments, are not too junior and not too important and senior, those with permanent addresses, and with an investment in the product becoming a success.

Of all the potential people the designers could speak to, those are filtered out who can be accessed or converted. They are made to fit, such as in Ron's case presented by Wilkie. If organisational

processes do not fit, for example, if they cannot quickly enough produce users for testing, then users are not included in the design process, or colleagues are converted. A process of proactively transforming and fitting users to production processes is unveiled.

Users are defined in their relations with the organisation (Woolgar, 1991). They may be ordinary people, but in relation to the organisation they may be delinquent users who need to be punished by non-interviews for not having paid their bill, or uninterested users who cannot be animated by everyday products, or shy junior users who want to get their work done before somebody tells them off, or voiceless users who are not able to tell the truth about the product on which their boss spent the IT budget, or invested bosses who need to prove their ability to sound judgement but have never laid a hand on the software, or users with permanent addresses. These are the living, breathing "unruly sites and subjects" which resist being centred in the human-centred design process (Suchman, 2007, p. 189). Several authors before have described how users are constructed within organisational practices and configured to fit where they most suit the organisations (Oygür, 2017; Wilkie, 2010).

While Volonté (2014) sees in the rise of human-centred design a foregrounding of ethical issues in design by designers (p. 9), this research shows that these efforts have had limited effects and that users are not fully present within production processes. They are weakly present. The human-centred framework does include some users but leaves other users out. It makes users fit the organisational processes.

For the designers working on designs, the supposed structure-providing and activity-shaping design processes help little in centring the user in their everyday activity. Human-centred design processes are a reminder that users need to be included in the production process, but this is not close to what designers experience in practice. Users are only weakly present. They are present as they fit the organisational processes. Only a selection of users is present, and not those, for example, who are too important to be tested with a camera on their head, or who are too knowledgeable about the product, delinquent, uninterested, shy, voiceless, or address-less.

3.2.5 THE ORGANISATIONAL NEGOTIATION

Designers suspect that *human-centred* is not always an honest label that organisations decorate themselves with. Leah Buley describes in the introduction of her book *The user experience team of one* her frustration with a lack of user-centredness despite a public avowal of organisations (Buley, 2013)*. Buley quotes another designer's complaint about failing design processes, which clearly struck a chord with her:

> *"I am at a point in my life where I know I want to do UX design after doing Web design for so long and then reading about usability testing, etc., six years ago. But my issue is I'm tired of working for orgs who say they care about their customer that don't do testing to even know what their customers want from them… I'm kind of fed up with working for people who don't get it." (Buley, 2013, introduction)**

Questions are raised if the user is viewed with enough importance within organisations. Lena explains that whenever she turns user research into development recommendations, it is very difficult for her to negotiate this work to be done by the development team. Generally, she has little power over scheduling design work for implementation. The development team is overwhelmed with work and implementing any designs changes takes a long time.

> *"I think the biggest issue we have here is the length of time the design spends waiting to be developed and then of course once you release it, you get [user] feedback, you want to iterate on it, you want to improve the experience, and the options for doing that are very limited." (Lena)*

She explains that this time gap causes issues. She tells me that often so much time has passed between handing it to the developers and their completing the implementation, that she needs to revisit the specifications in order to understand what the design was for and how she had intended it to work. Furthermore, by the time designs are about to be implemented, things have changed in the user interface, and so the mockups are out-of-date.

> *"We would be designing things with particular icons or fonts or particular UI components and design patterns that we had and then if we updated those on a different project in-between suddenly the early designs were out of date." (Lena)*

The relationship between the developers and the designers has been an ongoing topic in the conversations I had with the designers. The designers feel they need to negotiate hard in order to be heard by the developers. Most concisely, it is summed up by something one of the designers from the interview-based inquiry said:

> *"Developers can just say 'yes' or 'no' to anything, because if a developer doesn't want to do something [the] developer can say, 'Yeah, that bit there, I don't really want to build that, that's going to take 10 weeks to build,' and you have to go, 'Fine, okay, we won't have it.'" (INTINQ, a designer)*

Designers feel that they are in the weaker position because they are dependent on the developers for the implementation of designs. The separation between the design and the implementation of a product, which also showed earlier in the discussion on design processes (see section 3.1.1), is causing difficulties for the designers. Even when designers work according to their processes, they are still stuck if the developers refuse to adapt. Much effort of designers goes into maintaining the relationship with the developers, and some design processes are dedicated to mitigating this gap (see section 3.1.2).

Even when the design work is highly valued by an organisation, the designers' work will still not always see the light of day. The authors of *Lean UX* (Gothelf & Seiden, 2013)* tell about their frustrating experience with a pharmaceutical client for whom they researched an extensive list of systems, including competitor systems, and then designed a "new information architecture" for the entire system:

> *"The project took months. When the work was complete, we packaged it all up into a PowerPoint deck. This was a formidable deck–it would have to be, considering the $600,000 price tag! We went over to the client's office and spent an entire eight-hour day going over each and every pixel and word in that deck. When it was over, the client clapped (really). They loved it. We were relieved. And we never looked at that deck again. Six months after that meeting, nothing had changed on the client's site. I don't think they looked at that deck again, either." (Gothelf & Seiden, 2013, preface)**

The designers seemed to have been happy with their "formidable deck" which even the clients "loved," but the designers were not happy with the waste of time and effort.

Even if designs are needed quickly and instantaneously implemented, this can cause issues. The designers miss the time to carefully consider and craft their designs. They feel they are not able to consider the bigger picture if they are forced to rush and only react to local issues. Noah calls this *to frankenstein* designs:

> *"I show you our current [designs] – which I have designed out of a need to get this start-up done. So, they were quickly designed, frankensteined, bolted on, because we had new requirements, new demands. It's been built of necessity. One week we would have one [stakeholder] go 'we need this feature for us in order to function,' 'OK we can do that.' And then rush through the design and the development, to get it all out." (Noah)*

Being able to respond to the demands and challenges of the organisational practices in particular through the collaboration with people from other disciplines, is an ongoing issue for designers. When they need the developers to respond to their designs quickly, they often cannot get them to do that. When organisational pressures force both developers and designers to react quickly, then designers feel threatened, too. In both cases, they feel that their designs suffer. In the one case, their designs are wasted and become outdated; in the other case they are "frankensteined" and horrible. In both cases, the designers feel out of control.

Sometimes, designers feel subjected to power hierarchies, in which they must "shut up" and follow orders, codified as "requirements":

> *"At one point, the head of the different team came to me and said, 'Jeff, I need you to make these changes to the product you're working on.'*
>
> *I said, 'great, no problem. Tell me who they're for and what problems this solves for them.'*
>
> *Her response? 'They're the requirements.'*

> *I replied, 'I get it. Just to tell me a bit about who they're for, and how they're going to use this, and where it fits into the way they work.'*
>
> *She looked at me like I was stupid and said to me one last time with an air of finality 'They're requirements.'*
>
> *It was the moment that I learned that the word requirements actually means shut up."*
>
> *(Patton, 2014, p. xIiii)*

Patton (2014) expresses here that designs usually fulfil a purpose for the people who are using them, and that he, as a designer, is capable and qualified to get to the root of what people are trying to accomplish with a product. He feels that this responsibility, and to some extent self-determination, is being taken away by organisational procedures, such as requirements being passed on. Patton expresses here a struggle to regain control over production processes in which it should count "who [products are] for, and what problems this solves for them," and not what the organizational requirements are (p. xIiii). He problematizes that he, as the person qualified to care for who the product is for and their problems, is so easily and with an "air of finality" eliminated within the production process (p. xIiii).

Goodwin (2009), book author of *Designing for the digital age*, has a humorous summary of the issues she experienced as a designer, such as attending "a design meeting that resembled a rugby match," "[arguing] with a powerful CEO about why his personal preferences shouldn't drive the design," being confronted with "a group of hard-core engineers [who] smell blood in the water when you used 'because it looks cool' as a defence," being subjected to "stakeholders repeatedly change their mind" or the same having outlandish opinions about how people user their products (p. xxviii). Goodwin's wild mix of issues is a good recap of the many ways organisational processes don't quite play along with the proposition of designers for the production team to adopt design's human-centred methodology for innovation.

In summary, in the everyday work of designers within digital innovation, things are not as they are supposed to be. As it has become visible, design activity is subject to the rules, processes and workings of the organisation it is part of. Users are fitted to the organisational processes, and designers must adapt to organisational practices rather than organisations adopting human-centred

design processes. The representation of design as a human-centred methodology that can make partial things whole struggles to materialise in practice. In everyday design practice, the designers are concerned with a multitude of organisational relations which amount to anything other than the picture which has been created of itself as a human-centred methodology. There is a large gap between what design accomplishes in the representation as a human-centred mediation, and what it accomplishes in everyday production practices.

So, the question is if the human-centred design process model is not even close to an accurate reflection of design activity, what is it then? In what way is the human-centred design process representation useful for design activity? What is its function?

Designers cling on to the idea of the design process as a human-centred methodology for ordering production activity. Reproducing this idea again and again, designers experience a dissonance. In the following text, I will explore how the idea of the human-centred design process as the institutionalised shape of the work of designers is reproduced.

3.3 THE TROUBLE WITH MEDIATING PRODUCTION LANDSCAPES

Often, it is a struggle for designers to work well within organisations. Users are only accessible as far as organisational practices allow, and interdisciplinary relations resist being ordered by the rules of human-centred design. So, I will study how designers have taken it on themselves to improve their processes. The reproductive activity of innovation might reveal more about the practice.

The sociomaterial lens leverages a view on the "circuits of reproduction" in order to illuminate the effect and purpose of a practice (Gherardi, 2010, p. 506). Action in practice is guided by an understanding of the practice. I need to direct my attention to the place where the designers themselves mention the guidance they get for the design process in order to detect the reproductive mechanisms within design practice.

Designers often take guidance from books when they begin their career; when they seek to become a designer. These books are a source for designers to get them "started" in the guiding ideas of what design is and can be within digital innovation work.

> *"This is a book that I read in probably about 2010 […] 'A Project Guide to UX' […] this is before I was working in a UX role but that's what started me off thinking about*

to do all this because it was very, very practical, which is what a lot of books are missing, they're very theoretical but this just gave me all the steps I needed to do a user test, to do an interview, so, I just tried it all out, really, and that was at my previous job. That's the one, I suppose, I credit for getting me started." (Lena)

Designers analyse and compare their current situation with the design processes described in the books.

"I enjoyed 'Lean UX,' I thought that was good, and I really got the ideas in that. It's not something that I've ever really put into practice here because we're not very lean or very agile, so it doesn't really fit with how we do things, and I think to try and pioneer that sort of thing needs a lot of effort and coordination. You know, we're struggling with the basics of agile at the moment, so I think we're way off doing anything lean." (Lena)

Books are also a source to compare current processes to and sometimes suggest adjustments to daily work routines. Jack tells me:

"The most recent addition to my arsenal has been the book 'Sprint' - which is all about the Google Ventures Design Sprint - because it has actually allowed me to codify lots of different things which I've been doing for years but never really thought about as a standardisable methodology and it just so happens that other people have been out there, and they've actually said, 'We've organised this into a repeatable methodology which you can do for almost any project, almost at any time and this is how it works' and when I actually then looked at it, it's like, 'Well, yeah'; I do tasks like getting people to sit down and think about their own solutions and then bring them together and seeing which one people like. I've done things like, there's an exercise called 'Crazy Eights,' where you take a piece of paper, fold it 3 times, so end up with 8 panels, take your best idea that you've generated and then iterate it 8 times in 8 minutes, so things like that. I've done similar sorts of things to that in the past but never really codified it." (Jack)

Sometimes, books help designers "codify" or name things they have been doing all along, like Jack and the Crazy Eights exercise. An activity that he had been doing, probably taken up from somewhere else, has suddenly received a name and has turned the activity into a justifiable activity, which helps Jack speak about it and maybe turn it into something he can use with others.

Attending events also belongs to reproductive activities where designers can strengthen their understanding of existing concepts in human-centred design. Gerald talks with colleagues about an event on design patterns that he is going to attend.

> Gerald looks at the web page of an event in [local city] tomorrow. It is about design systems and pattern libraries. Gerald has taken the day off to go to the event. It is organized by a local design agency. He asks fellow designers (on Slack) if they were going to the event too.

Going to events does not only belong to the reproductive activities; it is also a social activity that can help one's career. Lena explains that in their profession, it is important to "be at events." Senior designers then turn to "speak[ing] at events." Hargadon (1996) reported that designers at IDEO negotiate their status not through formal channels but through social peer-relations, such as being invited by colleagues to "brainstorms." This may be translated to events. Being invited to speak at an event is an indicator of high status. Events are therefore not only sites of progressing design, but also the designer's career.

Writing books is something that designers can do once they have many years of experience, as the prefaces of the designer library books (some of them quoted above) show. Moving from listening to events to speaking at events, and from reading books to writing books, is part of the reproductive forces that progress design practice, and also the designers' careers. As visible in the prefaces to a lot of the books in the designer library, these books have been written out of frustration with existing design processes that do not consider the everyday experiences of designers. These practices of attending and speaking at events, and reading and writing books, may be called *innovation practices* of human-centred design.

Mingling at events, listening to events and speaking at events are important social practices that further the professional development of junior designers and senior designers. It may be possible that

attendance of events counts higher in the education of designers than more traditional education paths. Richard, who is responsible for hiring designers, tells me that he finds designers who just left university unemployable. In his view, it takes participation in design practice for them to become designers. However, not everyone is able to attend design events. Lena, for example, prefers to spend the evenings with her family, and she is aware that she is "missing these opportunities." Missing opportunities is an issue for designers with other commitments that conflict with, and go beyond, traditional work hours.

The social practices of innovating design also work towards institutionalising this particular field of design in digital innovation. The field of design becomes an institution. It will have a name. UX (user experience) has been one of the important names of this field in the past decade. Representations, such as names, (re)produce an aesthetic form of design, such as how *good design* and *creativity* look (people coming together, ideating, fun, lit stages, one person telling a story), and even how *the designer* looks (hands writing and sketching, youthful bodies acrobatically cycling through a studio).

The books, training events, and conferences postulate particular ideas; they do not only negotiate what is acceptable and what is not acceptable, what is in and what is out, but they also paint the picture of what is brilliant and what to aspire to. These practices thus shape *design* as an object, an object that people can see, as well as the *designer* as a subject. Designers can use design as a tool, as I will briefly elucidate here, and which I will discuss further in the rest of the analytical chapters. I will briefly illustrate the ways the designers used design to achieve a particular effect – Noah, to convince his boss to include him in processes, and Jack and Gerald, to insert their team into the wider organisational processes. This will be a brief glimpse, and I will then return at the end of the analysis to the effects of design.

Noah recently took his boss to a UX design conference. As a result of visiting the conference, the boss came to understand design as a process that can integrate customer feedback into internal processes:

> *"Since the [conference], [my boss] has more of an understanding of a designers' process. So, he wants me to be more involved in this feedback, to actually go and speak to the*

[clients]. Kind of collate it in a process, that I can integrate into the team more effectively." (Noah)

The effect of Noah's boss attending the conference was that he understood Noah needed to be placed more centrally in the organisational processes, integrating client needs with product development activities.

On a similar note, Jack and Gerald use the book *Sprint*, and the design process it postulates, to create a presentation about the design team's process. The presentation will be used to publicise the design process as a methodology for innovation within the wider organization. Jack and Gerald seek to use design as a tool to achieve an effect.

Lena and Jack show how they develop themselves as designers by reading books. Designers develop themselves through learning about new design processes, by reading books and going to training and events. I have also reflected on the practices of reading/writing books, of going to/speaking at events. The designers are taking seriously Cooper's call (2004, pp. 14-15) to find better production processes. These practices are effecting an improvement of design as a practice, as the book writers' motivations stem from frustrating experiences in practice. Noah, Jack and Gerald show how they used books and conferences to improve the perception of design within their organisations, and so the position of design within the organisation.

Designers are aware of design as an object, and what it might be able to effect. Besides working on their project tasks, they also work on design. They design products and services, and they also design design. Designers might not be able to see what stands in the way between the design process as it is supposed to be, and the situation they are in. Designers have an idea of how their work processes *ought* to look: Design ought to order production processes. But there is a gap between this and what designers experience. Simon (1996) postulated that the designer "is concerned with how things *ought* to be […] in order to attain goals, and to function" (Simon, 1996, pp. 4-5, my emphasis). It is possible to say that the object of design has become design itself. Design may be described as an object of design. It is now to find out more about this object of design and its constitution.

The design object currently works as a black box. A "black box" is described by Latour (1987) as a sociotechnical mechanism of which its internal relations are unclear, but only its input and output

are visible (pp. 2-3). While the black box is closed, its contents remain unknown. It is in the interest of this research to open up the black box of design, in order to shed light on the relationship between the representation of design and the experience in practice.

In summary, design is represented as a human-centred methodology of innovation, while the designers experience in practice that organisational practices resist these propositions of ordering through design. Design makes a claim to be a device capable of mediating, synthesizing and ordering entities, which I call *knowledge entities*. These are categories represented as naturally different entities, in how they know and what they know, such as *users*, *engineers*, *finance experts*, *human values*, *business value*, and *technical feasibility*, *subjective*, *objective*, *intuitive*, *logical*, *individual* and *collective*. The designers, in the meantime, experience the difficulty of actually centring *users*, and the lack of influence onto developer schedules and organisational processes. Nevertheless, design as an object is reproduced and maintained in practice, and I have briefly elucidated to what effects. In this chapter, I have focused on design as an object, and as a representation, and I have given an impression of its effects. But the workings of this black box design are missing, as is the representation of what design means in design practice. In the following analysis, I will view the design activities and how designers engage in design practices more closely before I bring these threads together in the final chapter.

4 DESIGN AS ORDERING

Human-centred design exists as a representation that describes it as capable of mediating different types of knowing and synthesising different entities, leading to a renewed human-centred order of technologies and the world. In this chapter, I will investigate close-up the activities around this concept of synthesising, mediating and ordering that designers do in their everyday work. Viewing these activities as the practices of ordering, they bear a tension between their representation and what designers experience in their everyday work. According to Gherardi (2012), within a "field of practices" there are practices that are "more important in shaping or constraining other social arrangements" (p. 156). Within human-centred design, I identify the ordering practices as such "enduring and powerful" practices (p. 156) that are crucial in the enactment of design as an object of synthesis and mediation in innovation.

4.1 DESIGNERLY MEDIATION AS INNOVATION GAMES

As discussed in the previous chapter, design has been presented as a device capable of integrating and re-ordering knowledge entities towards human-centred change. Design is understood to be a mediator, integrator and orderer of different entities (human values, business value or viability, and technical feasibility), of different types of knowing (subjective, objective, intuitive, logical), as well as of the individual and the collective in the sense of how Brown (2009) describes the design thinker as a "truly interdisciplinary" figure who can cross individual greatness with inclusive collaboration (p. 27). This representation of design has caught the attention of management as a possible new form of management paradigm (Boland et al., 2008; Buchanan, 2015; Dunne & Martin, 2006; Hassi & Laakso, 2011). Businesses are opening themselves to letting the design process drive innovation (Liedtka & Ogilvie, 2011; Martin, 2009; Osterwalder et al., 2014; Polaine, Lovlie, & Reason, 2013; Stickdorn et al., 2011; Verganti, 2009).

Gherardi (2012) describes in one particular sociomaterial practice study how orders are negotiated in practice amid an ambiguity of the rules. It is the ambiguity that allows the space to negotiate the rules, utilising the "mix of cooperation and conflict among and within groups" (p. 136). The relations within this space are "well known to the parties but not immediately visible to the

outsiders, nor easily accessible through parole [– the linguistic term of 'what is said']" (p. 136). Gherardi called this rules-negotiation the "production games" in her analysis. She researched a battery manufacturer, where the daily quota needed to be negotiated between the workers and management. As soon as it was announced that "the plates are soft", meaning that the material was not good to work with anymore on that day, the workers could call the end of their workday and get some free time. How "soft" the plates were, was a social negotiation that had as much to do with the worker who called it, as with the rest of the team. Whether to stop for the day was decided individually and collectively at the same time. The game of "co-negotiation" was conducted among many factors. The "individual reputation, the esteem of workmates, the workers' competence and the celebration of personal skill are at stake [, the] status between young/old workers must be maintained [, and] the conflict between the world-vision of those who want the free time zone and those who want to 'take it easy' (or work at what they regard a steady pace) [needs to be resolved]," as well as the particular agreement that although management controlled other elements in their relationship, the quota was to some extent negotiable (pp. 136-137).

I translate this for design: In human-centred design practices, design is presented as an ordering device of different types of interests and knowing, as seen in chapter "3 Design as a human-centred methodology." Design work is a part of the organisational negotiations, or what Gherardi (2012) calls the "negotiation of the social order that sustains production rules" (p. 136). This representation of design as the general way of ordering production may be understood as a move in the organisational practices. This move invites others to reinvent the production practices as *games* in which new orders may be negotiated. *Games* is a good descriptor for the methods and techniques with which design is articulated as a potential ordering device of production in digital innovation: Many of the prescribed exercises and principles are laid out as actual games, such as *voting* or *planning poker*, or at least not much unlike games – such as collaborative *sketching exercises*, as I will shortly introduce. The move within design practices to pit human-centred design as a new, general form of ordering production work in innovation, is an entering into the space of negotiating orders. This move includes, for example, offers of re-assigning special capabilities that are said to be typical for a designer. Olivia explains "I am being creative because it's making things […] I just think that our developers are creative as well, like I think other team members are creative just from the spring-board of their own expertise." Also, Miriam says: "I think that everybody has an inherent creative

part to them." This generous re-assigning of designerly specialities to the others in the team may be understood as an invitation to try out design and see how it feels in the hand as a tool. It is a move to bring design in as the general way of ordering innovation.

In the following text, I will call the production games in innovation the *innovation games*. Design practices are trying to reinvent production as innovation games, a site in which design is used as the general ordering device.

4.1.1 GAMES, RULES, PRINCIPLES AND EXERCISES

In human-centred design, numerous methods and techniques have been proposed for organising the relations within innovation games, such as between the designers, the developers, the wider business and the customers. Well-known are, for example, Agile methods that "strive to deliver small feature sets of working software into the hands of the customer as quickly as possible in short iterations" (Fox et al., 2008, p. 63). "User stories" are based on the presumed "business value the customer feels is most important for that iteration," and also prioritised accordingly (Fox et al., 2008, p. 63). Agile development is based on the principles of the Agile manifesto:

> *"Individuals and interactions over processes and tools*
>
> *Working software over comprehensive documentation*
>
> *Customer collaboration over contract negotiation*
>
> *Responding to change over following a plan" (K. Beck et al., 2001)*

These Agile principles express the wish for people to be put over processes and tools; focusing work time on getting software to work, rather than describing the work; taking seriously what customers (users) need, even if contractual agreements would release the company from the responsibility; and being flexible enough to react to new challenges, even if the plan defines a different (but possibly outdated) course of action. What becomes visible here is a promoting of people, interactions, collaboration and change, over plans, contracts, processes, tools and documentation. In these principles, I interpret there to be an opposition between something agile and alive (people, interactions, collaboration and change) and something static and lifeless (plans, contracts, processes,

tools). As the word *agile* implies, the primacy in this binary is constructed to be on the agile and alive.

In the Agile Scrum framework, work is broken down into short time periods called "sprints" (Mahnič & Hovelja, 2012). Agile Scrum methodology comes with a set of rules, which I observed in several of the settings where I visited the designers. For example, dedicated roles are assigned to team members, such as a scrum master who acts as a facilitator, activities such as stand-up meetings in which people discuss and coordinate their tasks on a daily basis are scheduled, and sprint planning is used as the general coordination of work tasks within the sprint.

The basis of any work done in Agile is *user stories*, that are created around what the team thinks the user needs. These user stories are then split into tasks for the team to implement. Teams adopt rules for these activities, such as negotiating the size of a task. Teams negotiate the sizes of tasks as numbers made up of estimating the complexity, or the effort in hours, or a combination of these. The collective estimating of the sizes of tasks is often done as a game – as *planning poker* – where people hold up cards with their personal estimates, which, if they deviate, initiate a discussion about the size of a task, allowing a team decision to be reached (Mahnič & Hovelja, 2012). I observed a sprint planning session with planning poker with Charlotte's team. Sprint planning is conducted following the rules that the team has agreed to. Teams set their own rules about how to reach decisions.

In the work settings where I observed designers, several teams used Agile methodology, and I was part of some of the activities as they are described, such as daily stand up meetings and sprint planning with planning poker. The teams adapt the rules according to their local circumstances and needs. Olivia, for example, described to me how the team runs a separate research sprint, where user research is done, feeding these findings into the other sprint where the development work is done.

Alan tells me about his team's way of working. They use "Jobs to be done" as a "lens that shows you the real needs of the customer" (Intercom Inc., 2016, unpaged). He shows me a photograph from a workshop. It shows a large paper taped to a wall, with many sticky Post-it notes. There are three headings on the paper: "When…," "I need to…," "So that I can…". These "job stories" describe what users need, what they want to do, and are a counter-emphasis to the "technologists [who get overexcited by] Artificial intelligence, augmented reality, machine learning, wearables" (Intercom

Inc., 2016, unpaged). The synthesis of team knowledge is understood to take place in "a vocabulary and framework to unite the team behind a product strategy" (Intercom Inc., 2016, unpaged). Alan also hands me a sheet of paper with 15 principles. They are the "principles" from the book *Lean UX*. *Lean UX* names Agile as one of its influences. The principles are:

> *"Cross-Functional Teams*
>
> *Small, Dedicated, Colocated*
>
> *Progress = Outcomes, Not Output*
>
> *Problem-Focused Teams*
>
> *Removing Waste*
>
> *Small Batch Size*
>
> *Continuous Discovery*
>
> *GOOB (Getting out of the Building): The New User-Centricity*
>
> *Shared Understanding*
>
> *Anti-Patterns: Rock Stars, Gurus, and Ninjas*
>
> *Externalising Your Work*
>
> *Making over Analysis*
>
> *Learning over Growth*
>
> *Permission to Fail*
>
> *Getting Out of the Deliverables Business"*
>
> *(Gothelf & Seiden, 2013, pp. 7-13)**

This relatively comprehensive list defines a whole framework of values. Lean UX principles encourage cross-functional teams and the collaboration between "software engineering, product

management, interaction design, visual design, content strategy, marketing and quality assurance (QA)" (Gothelf & Seiden, 2013, pp. 7-13)*. I will describe the important values of this list a little further, summarising from the descriptions with each principle: Teams are supposed to be "colocated" in the same location to encourage "communication, focus and camaraderie." Work is supposed to focus on progress towards outcomes rather than delivering predefined artefacts. Teams are supposed to focus on being effective and eliminating processes and tasks that are wasteful. A focus is on learning, and thus, small steps are encouraged. Teams are encouraged to continuously engage the customer to understand what they are doing and why; spend lots of time outside the office and get feedback on designs rather sooner than later; make sure everybody understands what it is the team seeks to accomplish. "Elite experts of their craft break down team cohesion" therefore "large egos" such as "Rock stars, gurus, and ninjas" are not welcome in the team. Teams are encouraged to "externalise" and get "out of your head and out of your computer" what you know. Teams should begin with making rather than spending time analysing. Learning is encouraged and therefore team members have the "permission to fail" and to experiment in order to "lead to increased mastery of skills" (Gothelf & Seiden, 2013, pp. 7-13)*.

Collaboration is described to create "shared understanding" that is "bigger and better than those of the individual contributors" (Gothelf & Seiden, 2013, pp. 33-36)*. The authors of the book *Lean UX* describe this through "increasing the teams' ownership over the work." They position collaborative design against "hero-based design", which they describe as "the practice of calling in a designer or design team to drop in, come up with something beautiful, and take off to rescue the next project" (Gothelf & Seiden, 2013, pp. 33-36)*. An image is created of a superhero. And while individual superheroes are not welcome, it seems their superpowers are wanted for the team. Nevertheless, not many teams do seem to have successfully implemented lean principles. David and Lena, independently from each other, mention the *Lean UX* book to me, as a resource for their daily work. Lena said she enjoyed the book and really "got" the ideas but struggled to understand how it could be implemented in her current work. She adds that things were "not very lean" at all in her team.

Sketching as a form of collaborative idea generation is an important method in human-centred design practices in digital innovation. The book *Lean UX* describes Design studio as an exercise for

the team. To illustrate the nature of this *game*, I will convey here some of their rule definitions: A set time period in the beginning is dedicated to discussing "Problem definition and constraints". Following that, everyone gets involved in "individual idea generation", which takes 10 minutes, during which people sketch ideas in a "6-up template – a sheet of paper with six empty boxes on it". One rule is here, for example, that the sketches are "visual articulations", "not written words". Then there is a "Presentation and critique" time that takes 3 minutes per person. Then everyone works to "iterate and refine" their ideas, taking 5-10 minutes, and eventually the team "converge" on one idea in a "team idea generation" exercise (Gothelf & Seiden, 2013, pp. 37-41)*.

The overcoming of the individual and the collective is attempted in various ways. In collaborative sketching, a collective synthesizing of problem and solution is pursued. In these collaborative games, designers pre-empt reservations team members might have about their drawing skills, telling them reassuringly, "you can sketch," explaining how to simply visualize ideas with shapes such as squares, triangles, circles and straight lines (Warfel, 2009, p. 48)*.

There are other, less formal ways for teams to generate ideas and keep track of them. I spoke with Olivia about her team's use of Slack, a chat application.

> One of the subject matter experts and stakeholders has made a suggestion in one of the Slack chats. Olivia says, "This is a thing to watch out for. A good idea that can get lost in the noise. … I am going to star it". On Slack, besides the individual chats with people, Olivia has an eye on what is posted in the general chat. Olivia feels responsible for taking measures to keep track of the suggestion (she *stars* it), in case it may disappear in the flood of messages in the chat tool. Posts are ordered by *newest first* and so any messages that are posted may bring a potential design idea out of sight and attention of readers.

Olivia *stars* comments as ideas. Olivia marks comments, which would otherwise be part of a normal conversation in a chat, as *ideas*. She marks a *good idea* to remember for later, so it may be picked up for the design of a feature.

"You can sketch" and "your comment is an idea" are reinventions of general ways of doing things as designerly ways of doing things. They are moves to entice the team to adopt the designerly ways of doing things.

Jack and Gerald's team use the Sprint methodology. In Sprint, a more formally described framework, the team decides on roles for the team, such as a facilitator, and the activities are organised according to a strict schedule lasting five days (Knapp et al., 2016)*. The team gets involved in many exercises, such as a rapid sketching exercises called Crazy Eights, or Solution Sketches (pp. 110-118)*. All team members will create such solution sketches that will then be voted on via dot stickers in order to come to a "Sticky Decision" (pp. 131-132)*.

Voting is a key method of reducing many items to one. Reducing many to one is a way to decide collaboratively. Voting with stickers allows the team "to form and express our opinions without lengthy debate" (p. 132)*. Rules and guidelines may differ from setting to setting. In this instance, guidelines suggest "hand[ing] everyone a bunch of small stickers (twenty to thirty dots each) […] There are no limits of rules for these dots. If people want to put dots on their own sketches, they should" (p. 133)*.

David tells me about a recent project where the team conducted collaborative sketching in order to bring all these "grand ideas" together by voting and synthesising.

> *"[…] after the discovery phase, after we spoke to the customers in their homes, we then did a sketching workshop, where we got a number of the stakeholders together, there was about six of us, and another designer from another project, and we discussed the issues and then did some sketching and then we did the whole dot voting thing, and then I sort of synthesised and merged those ideas into something that would work for a first phase … because, inevitably, people come up with some really grand ideas that we'd love to do in the future, but we're just focusing on this early stage at the moment."(David)*

Although the team conducted voting on the sketches produced, it seems that it then was David who took the extra step to "synthesise and merge" all proposals into a design. The outcome did not rely alone on the team members voting, but on David to merge sketches.

Gerald is a participant in a collaborative workshop in his organisation, and he takes the leading role in the drawing activity although he is only a participant.

> The workshop facilitator makes a slide presentation about "understanding the customers". After the presentation is finished, he divides people in to small groups, and they go off to sit around various small tables. "Get your creative juices flowing. I've also got some chubby, chunky pens for you to draw." Each group are given A3 sheets with questions printed on them, and three empty mobile phone screens in which the workshop participants can draw. The first task is to come up with the worst possible solution. The second task is to come up with a "good solution." Gerald is in a small team of three. The first task is funny, […] and Gerald has visible joy in taking part in this conversation. Now it gets to writing and drawing on the sheet. Another team member says, "I have no drawing skills, if someone else wants to draw …?" Gerald says "I don't mind," and takes the pen. As they continue to talk about what to draw, Gerald holds the pen in one hand, playing with it. He flips it in his hand. And while he is speaking, he keeps removing and replacing the cap on the pen with one hand, in a manner which looks like it has been practiced for a long time.

Gerald is used to having a pen in his hand; he is used to drawing. His proficiency becomes obvious in how he does not hesitate to take the lead in drawing, and how he acrobatically handles the pen. While the co-participant hesitates, it is easy for Gerald to draw. Visualisation and prototyping is an issue during collaborative workshops. Rapid prototyping in collaborative groups is postulated to be best achieved by simple everyday software like Keynote or Powerpoint in order to enable everybody to participate in prototyping (Knapp et al., 2016, pp. 184-186)*. However, in a different setting I speak with Jack, and he does not agree. He thinks that collaborative prototyping should take place in a document format which designers can pick up afterwards so they may continue to work with the document. What Jack says implies that it goes without saying that designers will pick up the prototyping work after a collaborative workshop, just as David told me about his synthesizing work after the team sketching exercise.

Designers do have an influence on collaborative workshops. And so do managers. I observed *voting* between two designers, each drawing a star next to the three favoured user journeys. However, also here the casting of the vote was not enough to come to a decision.

> The designers go back to the small whiteboard next to Jack's desk. There is the list of the five user journeys, and they need to decide on three.
>
> Jack makes a star next to three of the five items which he would like to tackle. He hands the pen to Fred to make his vote. Fred adds three stars, but only one star overlaps with Jack's.
>
> They discuss the voting and decide to prioritise one user journey which has some backing by the research they conducted, and which was also brought up by the management. Jack says, "It's in their head now." So, they agree to include it, and they also agree on the remaining two stories to work on.

Although voting with stars was invoked as a way of decision making, the decision about which user journeys to include was made based on what would be supported by the management.

In another instance of the management influencing a collaborative method, Jack tells me about the poor outcome of a workshop where the group had decided on an interactive animation to illustrate a product. However, because "[the manager] couldn't get his head around how it would actually work" the idea was dismissed, overriding the team decision and "undermining" the collaborative process.

Synthesising different interests and different types of knowing, and reordering this design knowledge in a human-centred way, is the key idea in the games, rules, principles and exercises of collaborative design work. This has become visible in my examination of planning poker, of the Agile principles, the principles of Lean UX and of collaborative sketching and voting. Prevalent is the idea of cooperation between different types of people, such as software engineers, product managers and designers, through rules that should converge different ideas into one. The essence of this idea is that people have "different backgrounds" (Mahnič & Hovelja, 2012, p. 2087). Martin (2009) speaks of "analytically trained managers" (p. 24), who think in "contrasting modes of logic" rather than "intuitive" explorations that need to be integrated into the "knowledge funnel" (p. 26). In the book

Sprint (Knapp et al., 2016)*, the team is described to be made up of different "expertise" (p. 33). Humorously this is illustrated through the plot line of the film "Ocean's Eleven," where a band of criminals plan a heist (p. 29). The authors muse that a design sprint "resembles that perfectly orchestrated heist" (p. 29), with different knowledge embodied in different job roles. For example, the "tech/logistics expert" understands "what your company can build and deliver," the "finance expert" can explain "where the money comes from [and] where it goes," and the "customer expert [who] regularly talks to your customers one-on-one" (p. 34). Sometimes, subject matter experts such as "cardiologists, mathematicians and farming consultants," are required.

In the Sprint process, the synthesising of different knowledge is described as "[turning] competing ideas into an asset" (p. 35). There is the understanding that knowledge and ideas can compete, and that they want different things. The book *User story mapping* (Patton, 2014) uses the metaphor of metric and imperial measurement to illustrate how collaborators may have competing understandings in their head, even if it may not be immediately obvious. The author illustrates this with a graphic, showing people with think-bubbles, each person thinking a different thing: One person thinks of a square, one thinks of a circle, and one thinks of a triangle (p. xxxiii). The user story mapping process is supposed to externalize this understanding "in my head" visually, and synthesise these different understandings into a new shape (p. xxxiii), a "common understanding," albeit "intangible [and unable to] see or touch" but enabling the team to "feel aligned and confident [to be] moving forward together."

The games, rules, principles and exercises just described are understood to be able to turn these singular knowledges with different shapes, into a synthesised knowledge with a mutual shape, with which it is possible to "move forward together." Several things are here implicit.

Firstly, there is a particular idea about the nature of knowledge. It is something that is in someone's head like a substance with an inherent shape, or nature. *Knowledge* substances once extracted from the head and synthesised appear to take on a new shape and a *new nature*.

Secondly, because they are separate in their nature, different kinds of knowledge are enacted as separate entities. Agile methodology constructs the binaries of *agile and alive* versus *static and lifeless*. Olivia's team distinguish between *research sprints* and *development sprints*, nourishing the binary *thinking* and *doing*. Similarly, Lean UX speaks of "making over analysis," feeding into the same

binary. The Jobs to be done methodology constructs the categories of *what technologists want* versus *what people want*. *Analytical thinking* is pitted against *intuitive thinking*, and all kinds of metaphors are used to describe the different natures of thinking and knowing. Even circles and squares are used to labour the point.

Thirdly, there is a particular idea of how these naturally different substances of knowledge are synthesised. Knowledges are understood as separate *parts* that can be brought into a *whole*, through games such as planning poker, sketching and voting. Individuals, as the carriers of singular knowledges in their head, are able to become enhanced entities of collaboration. Human-centred design is represented as the overcoming of the individual and the collective by creating an enhanced collaborative entity. Knowledge has been transformed, individual entities overcome, and a new, enhanced entity has been created.

The methods of human-centred design seek to soften the boundaries between production and use, between individual and collective, between thinking and doing, between different disciplines such as software engineering and marketing, and generally between different natures of knowing. However, the methods supposed to help synthesise knowledge, and to overcome the binary of the individual and the collective, enact the very categories that they seek to synthesise. By making these representations of categories, "cuts" are enacted as "distinct entities" (Suchman, 2007, p. 268). Design cuts different knowledges as natural entities, and it also cuts designerly synthesised knowledge as a naturally enhanced entity. In the representation of these cuts as natural, the entities are made up and reproduced. In the construction of these entities, a markedly strong category is the *human*, the *user*, or the *customer* around which these collective activities are centred. The *human* takes precedent, as visible, for example, in the Agile description of the alive versus the lifeless, in Jobs to be done where the customer trumps the technologists, or in the Lean UX principles that reinforces a "getting out of the [production] building [in order to meet users]" (Gothelf & Seiden, 2013, pp. 7-13)*. Design is represented as the synthesizing of separate entities and separate natures of knowing, by way of producing a new, enhanced *designerly way of knowing*. But using this representation, the separate natures are reproduced.

The *user* is understood to be a special species of being, and as separate to everyone in the production process. Also the *designer* is positioned as a particular type of person who can nominate ideas, as for

example, Olivia did, or David who took another step after voting to merge the ideas. Even if collaboration between many experts is postulated and enacted, it seems to be a matter of course that designers will take the lead in prototyping, or at least afterwards consolidate collaborative prototyping efforts. The *manager* is a significant influencer, as visible in Jack's voting exercise that has heavily influenced by what he thought management would want, or in Jack's experience with the manager who overruled the team decision. *Production* itself is under negotiation in the innovation games. By emphasizing the outsider position of the *user*, the remaining people are emphasized as *production*. The designer makes moves to mark the *production space* as the general *design space*, by saying, for example, that *everybody is creative* and *everybody can sketch*. It is a marking of space for design's purposes, more than it is a generous opening of what design means. The proposal to use design as the ordering device of production is an intervention in organisational practices. By proposing design as a tool to synthesise and reorder, designers make a move within the innovation games – it is an invitation for a renegotiating of entities and a reshuffling of positions within the order.

Innovation games promise a *synthesizing* of roles, natures and knowledges. However, in practice, these entities are *made up* in the innovation games. Within the innovation games, the entities are merely renegotiated, but not synthesized and dissolved. Closely examined design practices show that in action the user does not necessarily take precedent, but the precedent is defined by the unfolding of the action, as in these examples, involving decisions made by managers or designers. The primacy of the *human* is used as a representation, but who wins encounters is negotiated in action, with the *user* present as a particular entity whose ability to compete in the corporate innovation games I will investigate closer in the next section.

4.2 ESTABLISHING DESIGNERLY FACTS

In the practices of human-centred design, it is understood that design methods bring the user into the production environment. A large part of this centring of the user is conducted through user-research and through user tests throughout the design process (UXPA, 2018). Despite the collaborative opening up of the design process, as discussed in the previous section, the practices work to put the user within the responsibility of the designer.

4.2.1 USER RESEARCH AND USER TESTS

Human behaviour is widely described as a difficult-to-understand field. Many design books write about the psychology of human behaviour, emotions and reasoning (Norman, 2004*; Weinschenk, 2011*; Young, 2008*). Human decision making is famously illogical, but nevertheless firmly located within the brain, as a way of "thinking" (Kahneman, 2012)*. Persuasion and seduction are topics within design that treat personal dispositions as predictive structures open to encouragement, nudging and even manipulation towards desired behaviours (Nodder, 2013)*. Similar assumptions have been made in policy design attempting to tackle societal issues such as energy use and climate change, which has been criticised in its understanding of human behaviour as moving by choice through a fixed structure made up of societal values and attitudes (Shove, 2010).

The research of exploring the users and their lives is described as a core responsibility of the human-centred designer. The data from both the observation-based inquiry (OBSINQ) as well as the job adverts (JobADV), show that there may be dedicated user researchers or UX researchers, who complement designers in large organisations. The existence of these positions underscores the understanding that the analysis of user problems can be separated from designing solutions for user problems. However, as evident from JobADV, designers are usually expected to cover both types of activities. User research is described as creating understanding of the "range of audiences, their needs and behaviours". This understanding is facilitated through data collection methods such as "diary studies", "user testing", "remote testing", "in-depth interviews", "user interviews", "face to face interviews", "observation", "focus groups", "card-sorting", "tree-testing", and "surveys." At the end of gathering research data, the designers are described to "synthesize qualitative and quantitative insights" and "present back your findings through presentations and reports" (source: JobADV).

Human-centred design practice is described as an evidence-led practice. The Guardian newspaper job advert describes user research as critical in making the "right decision" in the design and innovation of their digital newspaper products: "The Guardian's leadership view evidence-driven, agile ways of working as critical to ensuring innovation and business success – your role is to help them make the right decision" (source: JobADV). Job adverts talk about "insights" and "evidence to support our hypotheses" (source: JobADV). Designers tell me that they are looking at "metrics," and

about getting "hold of some data." Possessing user data is meant to put an organisation onto the right track. Richard describes how human-centred design can eradicate bias and pre-conceptions:

> *"Human-centred design […] allows us to start to understand what it's like to be in the world of the person that we're trying to help. So, if we start off with a very broad look at them, 'Who are they? Where do they live? What kind of technology do they have in their lives? What are their overarching ambitions in life?' and through more research, we start to get more detail around that and what's happening is that you're starting to leave behind your own biases and your own preconceptions and you're starting to entertain someone else's mindset. So, human-centred design, I think, enables that journey that enables you to leave behind your own cognitive bias, your own pre-conceptions about how someone might use a product or fulfil a need, or even what that need is, and actually start to understand it from someone else's mind" (Richard)*

It is understood that by applying a human-centred framework to production processes, it is possible to neutralise the bias that team members hold about how to proceed with the design of a particular product or service. Knowing what the user or the customer needs is seen as important knowledge for proceeding with the process of production and its many shape-giving decisions. Designers are understood to be able to develop knowledge about the user, and their designs are expected to be guided by this knowledge. Designer job adverts speak of the designers needing to present and justify their designs with the knowledge they have about the users (source: JobADV).

I did not observe the designers in contact with the users directly. It was part of the ethics agreement between the designers and me to avoid contact with their organisation's customers and users[7]. However, I saw designers prepare for contact with users, they told me about their contact with the users, and I saw them use the data that they collected during user research.

[7] It could potentially have led to complicated ethics responsibilities where I, as the researcher of design activities, am responsible for the designers' protection, and the designers, as the researchers of users, are responsible for the users' protection, whereby there would not have been a direct ethical agreement between me and the designers' users.

Figure 21: This is the research setting where I stand next to Anthony at his standing desk during his work on the assumptions

Anthony, who I visit as part of my shadowing activity, conducts user research based on a hypothesis-driven methodology. An original set of assumptions around the value of a new planned product was collated by himself, the design manager, and an experienced subject matter expert who had been in the company for a long time. One assumption reads "Parents are interested in the [X] features because they lack an overview of what's going on."

Anthony's job is to test, or identify, the potential value of the planned features. For this, Anthony is planning to conduct a survey and afterwards, a "deep dive" in the form of interviews. Anthony will test during the interview sessions some concepts in greater detail. In preparation for this user research, Anthony has moulded the initial set of assumptions into hypotheses, which he is now looking at in a spreadsheet, formatted in columns and rows. Anthony shows me the format he is following for the assumptions spreadsheet:

"If (action) then (outcome) because (customer need/problem). This is considered true when (measure)."

After some disruptions, Anthony continues with the spreadsheet. He types into a cell for a few minutes, and the text goes all across the spreadsheet. When he is finished typing, he clicks a button to make the content wrap, so the text does not overlap the other text. Anthony crosses his arms in front of him, leaning on the standing desk, looking at the spreadsheet on the screen.

He opens a "raw assumptions" document and looks at it for a while in contemplation. It looks like an older document which precedes the hypotheses document. He keeps the finger on the trackpad and moves the mouse cursor slowly over the cells in the document. Then he crosses his arms again, resting them on the desk, to shift weight for a moment. He looks out of the window, then returns focus to the computer in front of him and moves the computer with both hands to put it straight.

He goes off to get the notebook from his actual desk, where he used to sit before the back injury happened. Anthony comes back to the standing desk.

He uses the paper notebook to make notes. He places it in between himself and the computer and looks alternatingly to the screen and the paper, on which he writes. When he writes notes in his notebook, he uses the left hand. When he is finished writing in the notebook, he places it on the right hand side of the computer, still close and visible.

Anthony continues to work on the assumption spreadsheet. He adds comments to the spreadsheet cells. In between, he looks at his emails.

In the assumptions spreadsheet, he adds a comment via "right click + Add new comment" to say "I think we have enough data already …"

He adds another comment "Think there's enough research to prove it."

It becomes obvious from watching Anthony work that he seeks to evidence the steps on his way; make his path accountable. He uses the language of "hypothesis" that is not yet a commitment to a truth, as they are mere constructs made out of assumptions by him and his team members. But in his

ongoing work, he seeks to find data and to prove some of these assumptions. Anthony knows how to carry out analysing activity in design. His work with the spreadsheet and its cells is part of his design work. He understands and knows this activity as an analysing activity, aiming to provide true facts that can aid design decisions. Nevertheless, as I am going to show in the next extract, I observed that the establishing of facts is part of the practice of nominating facts, which the designers negotiate amongst themselves. At my visit with Alice and Alan's company, the two designers review Alan's designs. The atmosphere gets a little agitated, when Alice makes recommendations that Alan suspects to be mere "assumptions:"

> They continue now to review the wireframes on Alan's screen.
>
> Alice points at an item in the form elements which manipulate the graph and says that this item should be last in that navigation bar. She gives reasons for her assessment. "First, they choose what they want to see, and then they choose how they want to see it. You will see that the users go …"
>
> Alan responds, "But this is an assumption." […]
>
> Alan says tongue in cheek that Alice is talking "by feeling." Alice responds, "I never talk by feeling. But I have talked to many users [who use this product]." And she adds that she has also seen user metrics [logs that show how the application was used].

The two designers resolve the tense meeting by a bit of banter, and by agreeing to carry out further user research. It becomes visible that designers themselves check very closely with each other how valid they take one's assessment about the users' experience to be. Research is said to be used as a means to disperse arguments and disagreements. Nevertheless, in the practices of the designers, user data does not have the function of dispersing arguments and ridding bias. As visible in the conversation between Alan and Alice, there is negotiation about which of the data count as facts, and which count as biased assumptions. The establishing of facts for designerly ridding of biases within organisations underlies itself a negotiation between the designers that decides what qualifies as a designerly fact. In the following extract, I will show how agreement amongst the designers leads to a collective establishing of what can count as a fact fit to enter the organization.

Charlotte is a designer in a large tech company. She is upset and speaks with her colleague Alan, another designer. In order to help Charlotte, Alan suggests user research to get rid of the organisation "politics" that Charlotte had just been subjected to:

> Charlotte has an issue. She had created some mockups based on a decision which had been made between Charlotte and a mid-level design manager around using Helvetica font. But this decision was now questioned by a more senior design manager. Charlotte doesn't mind changing the font; she doesn't see it as a big deal, because it can always be changed again. But in her eyes, these decisions need to be made, so she can complete her work on time. She had sought clarification on the font, but the senior design manager didn't give her feedback, so she resorted to asking the mid-level design manager for a decision, which resulted in the current choice of Helvetica font.
>
> "The problem is that here are so many politics."
>
> "Yeah!"
>
> Alan offers to help. It is also in his interest to get things signed off in a timely manner. It has also been his problem that decisions are being delayed by senior managers. The problem is that everybody has different opinions. And it is a problem "when things become personal."
>
> As a strategy, Alan offers to do user testing whenever questions arise what font options would be preferred.
>
> "We get the data, we see what people prefer. We can provide three options, and we user test."

Alan proposes a user test as a strategy to resolve problems that otherwise "become personal." He proposes the user test as the fact-making device for getting rid of the company politics that have upset Charlotte.

In the book *About face* the design process is described as providing a "clear rationale for design decisions, makes collaboration with developers, business people easier, and ensures that the design in question isn't guesswork, the whim of a creative mind, or just a reflection of the team members' personal preferences" (Cooper et al., 2007, p. 25)*. The user test is here used as a tool to document and provide evidence of design decisions. Goodwin (2009) confirms this method in her book: "If you have a method that explains how you go from point A to point B, people are more likely to judge in your favour than if you say, 'Trust me–I'm a professional'" (Goodwin, 2009, p. xxviii). Another design book advises: "If you can produce the results that show that more people click on pink buttons compared to other colours, then the decision becomes objective […] the conversation shifts away from whims and personal preferences to measurable results" (Anderson, 2011, p. 143)*.

Miriam, a design manager, speaks about the importance of a designer being able to convincingly articulate what she or he has done:

> *"When I talk about my work and I've only got one hour to talk about it, instead of going, 'Blah blah blah,' […] Start off a meeting like they would and go, 'Right, so we've come here today because we want to do x and what we want to get out of it is x, so what you'll take away today is x, and this is how we're going to go through it' [and] then you talk about, 'So, what I discovered in my design xy & z was … and I've had to frame in this way and what I managed … and what I learnt was … and the decisions I've come to this point are x, so therefore you've got y,' instead of just going, 'Yeah, well, you know, I kind of sat around and then I had a cup of coffee, and I thought pink would be better than blue.' [So, you help them to understand] the intuitive part and that's a very hard thing for designers because […] you still go on instinct often and then you have to go, 'Oh crap, how do I articulate this now?'" (Miriam)*

Knowing as a designer is understood as genuine and deliberate work, but designers worry about how their work will come across. Articulating design decisions well and convincingly is an important topic for designers. Lacking the vocabulary of explaining their work to others, designers see the designerly decision making process in danger of being warped by company politics. "Company

politics" was mentioned several times, and the defeat of politics and bias is a guiding idea of designers in their work.

By proactively learning to communicate the activities of the design process, and by utilising scientific tools such hypotheses and experiments, design is used by the designers to establish "data," and "evidence." This can be seen in Jack's story when he *broke* the project he was assigned to. He tells me that he needed to *break* it because it wasn't based on what users needed, but simply on the whim of a manager:

> *"I walked in, sat down, was given a whole load of documentation to go through and told, 'This is the project you're working on, this is the device which is going to be used in this project,' and the first thing I said was, 'Why have we got this device? There is no research in any of the stuff you've given us which says that this is what people want.' […] So, the initial question for the project, which had been running for 8 months by the time I joined it, was going in completely the wrong direction; no-one had actually asked the users, 'What is your problem?' […] The first thing I did when I realised that there was a missing piece of information about who had told us this was what people wanted, I went and asked, I said, 'We've got this [smart device], where did that come from? Who told us that this is what users wanted? Who told us this is the solution? Did we go and ask users and say, 'If you could have anything, what would you have?' and they came back, and they told us this? Was there actually an educated guess which was drawn out of a bunch of disparate pieces of ad-hoc third-party research which was all brought together?' … so, sometimes you look at the world, and you see from other people's experiences that there's a problem and you kind of go, 'I know how to solve that problem,' even though no-one's actually expressed it to you, you can come up with a solution for it or, as I put it, was it just someone's wet dream that they decided they wanted one of these and then went out and justified it? [It turned out] it came from the top down and because it came from the top down no-one felt empowered to challenge it." (Jack)*

At the same time, as *breaking* the project, Jack proposes designerly analysing of what users want as the right tool. Designerly analysing as a tool does not necessarily require speaking with users, as Jack

explains; it may also contain a hunch generated through an "educated guess that was drawn out of a bunch of disparate pieces of ad-hoc third-party research that was all bought together." He makes clear that the design process has many possibilities of understanding a problem well. But he also makes clear that he cannot see a satisfactory establishing of evidence that the stakeholders of the project have understood the problem of the user well. In his view, it was only a manager's whim. Jack so *breaks* the project and refuses to proceed. I also hear this word *break* from Alice who tells me about how she has challenged projects – when managers wanted to proceed "too soon."

Designers seek to establish design as an evidence-based method that is accountable. Anthony follows a process that uses the language of hypothesis, in an attempt to explain in author Goodwin's words, "how you got from point A to point B." The two designers *breaking* projects illustrate the designers' use of *understanding the user* as a tool to assert design, and by extension themselves, as the ones with the authority to sort apart what counts as facts and what as bias. Within the afore-established innovation games of production practices, the designers assert their position as the representatives and centrers of user needs. With human-centredness as one of the rules established within the innovation games, the designers have a good argument when they challenge and discredit decisions that skipped user-centred analysis of the problem. Also, they actively nominate what counts as a user-centred analysis. The designers (Jack, Alice, Alan) conducted the practices of nominating facts in order to try and put a stop to certain project decisions. What might otherwise be traditional top down decisions, made by managers, turns in design practices into a matter of user-centredly evaluation of facts. When designers manage to *break* projects, they shift positions from receivers of top down decisions to policing what counts as a fact. This potential position is further enhanced by the weakly present, or even absent, user, as established earlier (see "3.2.4 The difficult to access user"). I speak of potential positions, because designers make moves within the innovation games. They may not succeed in reaching these positions, but design practices effect these potential positions for the designers. The designer seeks to keep a strong hand in the interpretation of the user-needs. The policing of design-related facts is an ability that designers practice. As visible with Jack and Alice, designers keep finding themselves in challenging situations where they need to *break* a proposed solution. It is a move within the innovation games. Each designer I have observed has different ways and means of navigating this area. The beginning stages of a project, which is according to representations of human-centred design equalled with analysing and understanding a

problem, and in which it is understood that defining decisions are made, is a potential conflictual area in which designers seek to assert themselves as authorities. In the innovation games, not only the different disciplines but also the traditional ways of managing projects, are challenged. Different roles and positions are challenged. In attempting to take the position of policing facts, and thus making design decisions, Jack, Alice, Alan and Charlotte challenge the conventionally agreed decision makers, such as managers. It is thus that design practices challenge traditional organizational orders and hierarchies.

These are the *local onsite* negotiations on behalf of the user, and I will show in the next section how designers use internet resources providing support to them as *global sites*, in order to help these negotiations further.

4.2.2 ON BEHALF OF THE USER

When discussing the design of a company presentation that Lena has created for the marketing department, Lena explains to the marketing manager that the colour turquoise (which is part of the colour palette of the brand guidelines) is difficult to use on screen-based displays. She expands that this shade of turquoise is too light to use as a background on white text and too dark to use as a background for dark text. Lena refers here to a set of guidelines that are called "accessibility guidelines" (McKay, 2013, p. 157)*, that prescribe a contrast ratio between two colours (such as black and white) that must be at least 4.5:1 "to provide enough contrast between text and its background so that it can be read by people with moderately low vision"[8]. The book *UI is communication* warns "contrast ratios are difficult to calculate (in practice, you should use a contrast calculator)" but gives as a guideline that text should be "black (or near-black)" while the background should be "white (or near-white)" or the other way round (McKay, 2013, p. 157)*.

The Web Content Accessibility Guidelines (WCAG)[9] are stable, referenceable technical standards. The repository contains techniques for meeting the guidelines as well as the standards themselves, and the current version is 2.1. The organisation responsible for the maintaining and publishing of these guidelines is the World Wide Web Consortium (W3C). The WCAG guidelines describe how content on the web should be prepared for interaction with users. There are 12-13 guidelines that

[8] https://www.w3.org/WAI/WCAG21/Understanding/contrast-minimum.html
[9] https://www.w3.org/TR/2018/REC-WCAG21-20180605/

are organized under four principles: perceivable, operable, understandable and robust. Each guideline has testable success criteria, which are at three levels: A, AA and AAA. Each guideline has support material, comprising "success criteria," "techniques" and additional guidance on "understanding" the guideline[10]. The guidelines describe in detail in what ways UIs need to accommodate human abilities. The designers generally refer to "accessibility" when referring the WCAG guidelines. The job adverts refer to these guidelines through skills requirements and responsibilities like "Working knowledge of design principles for sites optimized for accessibility," "Experience of designing to meet accessibility requirements and standards," "Understanding of accessibility and usability concerns," "You will use your expertise to ensure the UX output meets usability, accessibility, design and quality standards," and "Disseminating expertise of how design decisions impact accessibility both internally and externally" (source: JobADV).

The well-known organisation Nngroup publishes online a large archive of user research and "empirical findings to both guide designs and, most importantly, help make a case for investing in usability and user experience"[11]. Several designers in my study used the Nngroup website as part of their work: Lena used the Nngroup website while she was working on the *filter* UI components that assisted their users in managing their reports. She landed on the Nngroup website when looking up best practices for filtering lists of documents on Google Search. David read an Nngroup article on "design guidelines" for "dropdowns". The Nngroup website is widely used amongst designers as a quick reference and as a guide. When explaining to me his ways of working, Alan showed me a document that lists 10 principles as guidelines. They correspond with the "10 Usability Heuristics for User Interface Design" published on the Nngroup website[12]. The list goes like this:

- "Visibility of system status" reminds designers that "The system should always keep users informed about what is going on, through appropriate feedback within reasonable time."
- "Match between system and the real world" calls for a following of "real-world conventions, making information appear in a natural and logical order."

[10] https://www.w3.org/WAI/standards-guidelines/wcag/
[11] https://www.nngroup.com/about/history/
[12] https://www.nngroup.com/articles/ten-usability-heuristics/

- "User control and freedom" is about the movement within a system. It calls for letting users always leave a state easily if they navigated to it through a mistake and to allow them to "undo" and "redo" something easily.
- "Consistency and standards" promote the use of consistent words, graphics and layouts, so that users can easily understand the meaning of different function in a software. "Jakob's Law of Internet UX"[13] says that "Users spend most of their time on *other* sites" (my emphasis), meaning that it is, therefore, important to stay consistent within the larger landscape of website and software conventions.
- "Error prevention" is a guideline for designers to avoid error prone conditions and to provide users with a "confirmation option before they commit to the action." For example, to help users avoid deleting files in error, a dialogue box should appear asking users if deleting files X, Y and Z was really what they wanted.
- "Recognition rather than recall" means that users should not have to memorise what something means, but that meanings should be visible.
- "Flexibility and efficiency of use" calls for, whilst invisible to the "novice user," providing functions for tailoring the frequent actions for the "expert user."
- "Aesthetic and minimalist design" reminds designers to be concise and avoid clutter on the screen.
- "Help users recognize, diagnose, and recover from errors" calls for "constructively suggesting a solution" if something has gone wrong.
- "Help and documentation" reminds designers that a manual should be easy to find and give helpful advice.

These usability heuristics convey the type of information these guidelines provide to the designers. These guidelines are worded in ways that support an understanding of the rigor and evidence that user research can provide. There is talk of "natural" orders, emphasising the natural habitat of humans in which the artificial technologies will intervene. The guidelines emphasise how the designer takes control of the UI in order to mitigate this technological intervention in human life.

[13] https://www.nngroup.com/videos/jakobs-law-internet-ux/

The guidelines are referenced during the designers' everyday work in order to substantiate requests to the developers. Olivia tells me that she works on an issue that she has identified when working with her team on the design of an online questionnaire.

> *"I raised with our development team that if someone's taking their sweet time filling out the questionnaire, there's a session time-out which is quite generous, like 30 minutes. We check. If they're still idle, we'll give them another 30 minutes, but what we found is that people are sort of not being given any feedback when their session gets expired, so it's still a bit of an education that somebody will be taking 60 minutes to fill out a form. But it's still there, and so I can raise it and say that we're getting feedback from people who are getting kicked out, and develop some concepts for how we can communicate to users that their session might be about to expire, and obviously the developers will be working on putting that in place." (Olivia)*

Olivia indirectly refers here to the guideline of "2.2.6 Timeouts." The guideline demands compliance with the following text:

> *"Users are warned of the duration of any user inactivity that could cause data loss, unless the data is preserved for more than 20 hours when the user does not take any actions." (WCAG guidelines on "timeouts"[14]).*
>
> *"[…] when a timeout is used, users [need to] know what duration of inactivity will cause the page to time out and result in lost data. The use of timed events can present significant barriers for users with cognitive disabilities, as these users may require more time to read content or to perform functions, such as completing an online form.*
>
> *"[… during] the completion of an online process, such as to reserve a hotel room or purchase a plane ticket, a user with a cognitive impairment may become overwhelmed with lengthy instructions and data input required to complete the process. The user may not be able to complete the process in one sitting and may need to take a break. Users should be able to leave a process without losing their current place within the*

[14] https://www.w3.org/WAI/WCAG21/quickref/?showtechniques=143#enough-time

process, and without losing information that has already been entered. If users cannot take a break and check their work, many will often be unable to complete a task correctly". (Further WCAG guidelines on "timeouts"[15]).

The guideline describes the consequences of not giving users enough time to fill out a form and of not telling them how much time they do have. It explains the effects of a "cognitive impairment" and warns that non-compliance with the guideline can result in users being "unable to complete a task correctly."

Olivia makes a case to the developers about improving the interface. On behalf of the user, the designer instructs the developers of the best way to implement the UI.

"Defaults" in the user interface are values that are attributed to certain elements in the UI before the user changes the value or makes a different selection. For example, a form field providing several options to select (option A: "Yes, switch my membership and save up to 83%," and option B: "No thanks, continue downgrading my membership") might have one of these values pre-selected (see guidelines on "defaults"[16]). For the development team, there is a large range of considerations attached to the design of such form options and defaults. The Nngroup article describes how, depending on the context, certain defaults are "reasonable". However, the Nngroup article also talks about the "power of defaults"[17], in that users are often steered by the value that is presented to them, rather than being freely able to make a choice of which value is most suitable to them. Defaults have benefits. Defaults save time, when filling out forms, for example. In this article, Nielsen expands:

"In forms and applications, pre-populate fields with the most common value if you can determine it in advance. For example, on the registration form for my usability conference, if people register for an event in New York, the country field will say 'United States' by default, but if they register for London, it will say 'United Kingdom.' Obviously, many people come from other countries, and they'll have to change this entry to specify their own country — but they'd have to specify it anyway if

[15] https://www.w3.org/WAI/WCAG21/Understanding/timeouts.html
[16] https://www.nngroup.com/articles/radio-buttons-default-selection/
[17] https://www.nngroup.com/articles/the-power-of-defaults/

we'd left it blank. By choosing the most common country as the default, we save many users that bit of work."

However, by making registration easiest for those who already have the easiest access, such as U.S. residents for U.S. events and U.K. residents for U.K. events, Nielsen reinforces the presence of those who are already dominant in the respective setting. There is a configuration of opportunities and possibilities on which designers have influence in these negotiations.

During my observations with the designers, I came across the topic of "defaults" several times.

> David told me how they are using "sensible defaults" in their app, which calculates electricity use. The product contains questions around the estimate of how many devices of some sort, for example, toasters or kettles, the user possesses. David said that it is safe to assume they have one, or possibly two, of these devices. Furthermore, he explained that users would find some things easier to estimate per day, rather than per week, month or year. So, the team would choose with each question whether they would default the estimate range to day, week, month or year.

On another occasion, Olivia tells me about her work on a survey "opt-in".

> Olivia works on designing a survey opt-in at the end of a form. Users can opt in to take a survey about the product. Organisation A is considering changing the survey *opt-in* to a survey *opt-out*, so the response rates may increase. Olivia ponders whether this is "OK," and how to go about this most meaningfully. Changing from *opt-in* to *opt-out* means changing the default value of the checkbox that asks whether they would be willing to participate in a survey from no to yes. Users will then have to take the step of unchecking the box if they do not want to participate. Olivia thinks that this could lead to users accidentally agreeing to the survey if they do not read carefully as they move through the form. Olivia is concerned that this may be cheeky, and that users could be tricked into consenting to the survey. […] Olivia looks at the work which the developers had

> already begun on this project. Olivia says to it, "This is a typical thing where a developer goes 'We just tick this box,' but we need to make sure it's OK."

Olivia is concerned on behalf of the user and thinks of mitigating measures. She tries to find a solution that honours what the organization wants to achieve – increased participation in user feedback – and at the same time, she wants users to have the choice. She worries about the current solution leading users into a choice they did not make. She worries about users with dyslexia. Olivia thinks that carefully drafting the text around the checkbox and considering its "readability" could be a good solution. Legibility, readability and concerns regarding dyslexia, as Olivia refers to here, are described in the WCAG guidelines. The "reading level" guideline[18] says that text "should be written as clearly and simply as possible". It further expands,

> *"Reading disabilities such as dyslexia make it difficult to recognize written or printed words and associate them with the correct sounds. This is called 'decoding' the text. Decoding must be automatic in order for people to read fluently. The act of decoding text word by word consumes much of the mental energy that most people are able to use for understanding what they read. Text that uses short, common words and short sentences is easier to decode and usually requires less advanced reading ability than text that uses long sentences and long or unfamiliar words." (WCAG guidelines on "Reading Level"[19])*

The guideline determines that "when text requires reading ability more advanced than the lower secondary education level, [simpler] supplemental content [should be] available." This guideline is based on the "International Standard Classification of Education (UNESCO), which was created to allow international comparison among systems of education." As Olivia says, it is part of the designer's job to make things "accessible" to all "audiences". This includes making content "readable and usable" for people who have "cognitive, visual, hearing, all sorts of disabilities."

> Olivia is working on a large spreadsheet with several hundred lines and about a dozen columns, containing the detailed description of the content of a medical

[18] https://www.w3.org/WAI/WCAG21/quickref/#reading-level
[19] https://www.w3.org/WAI/WCAG21/Understanding/reading-level.html

> assessment tool. Olivia focuses on the questions which will appear in the user interface as the user is stepping through the assessment tool. Olivia scrutinises the language used in the questions. She looks at both the question and the options to respond to questions. She rewrites some of the text "to improve readability and comprehension." Will users understand? She changes questions which read too technical. She explains to me that she is considering for example, if "someone with an elementary education ..." would understand this. She simplifies questions to read more colloquial, eg, "less than 50%" she changes to "half or less." The language, which the subject matter experts have used to compose the questions, contains expert knowledge, which Olivia is careful not to alter.

Designers such as Olivia take great care to negotiate the UIs of their products on behalf of the users. They will use sites such as the WCAG guidelines or the Nngroup heuristics, which have established certainty about human capabilities through research. I have demonstrated several examples where designers in their everyday work referred to sets of guidelines around the user. In relation to the site of the production game, these sets of guidelines can be described as *offsite* negotiations. These are sites that have their own negotiation games ongoing – for example who sits in the W3C consortium, who writes on the Nngroup website. These are boxed off sites with their own negotiations, not immediately available to the local innovation games, but only through intermediary resources such as the Nngroup or the WCAG website. These are, however, useful sites for the designers that can be referenced. Designers refer to these sites in support of their position in the innovation games as establishing what counts as fact. It is in the designers' negotiation of their positions that these offshore sites of knowledge are referenced as needed. Designers attempt to take up positions within human-centred design practices as the experts on interpreting user needs and combining them with the local requirements. Designers refer to these offshore sites of user knowledge in addition to the earlier discussed user research and user tests. Lena explains why the turquoise cannot be used. Olivia explains why the timeout mechanism in the questionnaire needs to be redone, David describes why the select box should say "weekly" instead of "monthly" by default, and Olivia explains why the text that the experts have written needs to be changed. The designers use these sites of user knowledge in their everyday work, and use of those sites allows them to account for why something was done this

way, why something should be done in a certain way, or why a request is a valid request. Designers take user knowledge and bring it into the production practices. In human-centred design practices, designers seek to stabilise their positions as user experts, through the establishing of facts around user needs. The establishing of facts unfolds between the designers and the methods of gathering information, which may be local negotiations, or through *offsite* information, and are therefore much within the hand of the designer.

There is a large bulk of *offsite* information about users, as in the WCAG guidelines, or the Nngroup website. Whether designers pick from these sites, and what they pick, is relatively flexible. These pickings may be used in the local negotiations, where the designer explains how things are for the user. How long they need to fill out a form, how they need to read their words, and how well their eyesight can read in certain colours. These pieces of information are selected and fit into the local conversation. This fitting work may sometimes serve the designer in simplifying their own work processes. These are handy explanations, ready-made packages, which can be picked up and fitted as needed. But they are black boxes (Latour, 1987, p. 3) and nobody quite knows how they were made up. In design practices, the designers are made responsible for gathering information around user needs. The designers function as the pickers, interpreters and fitters of user information. Bestowed with this offsite user knowledge, along with their own processes inspired by scientific language, designers are represented as possessing objective knowledge about use.

Human-centred design practice enacts the centring of the user by way of the designer bringing user information into the production process and fitting it in. The idea is that, according to its representation, design can synthesise all the different entities and natures of knowing. However, it is through the designer's fitting work of the knowledge about the user – the scientific tinkering with hypotheses, the selective picking of off-site information, the interpretations of these, and the bringing of the results into the production process – that the distance and separation between production and use are produced. Designerly facts, which represent the users, replace the actual users and take away the difficult challenge of bringing actual people into the production process. The user, as a replacement of actual users, occupies the spot within the production process whose vacancy would reveal the users' absence. Users are so excluded from the production process. Ironically, a separation between production and use is enacted in human-centred design practices.

Furthermore, as an effect for the designers, they do not need to reveal their hand in the "decision laden" fabrication of facts in this local fitting work of user-related knowledge (Knorr-Cetina, 1981, p. 12). Knowledge about the user is represented as an objective knowledge to be harvested from the natural habitat of humans.

The user has a special place in production practices that is facilitated through the designer. In the collaborative design process, everyone is said to bring their own expertise, such as the *tech/logistics expert*, or the *finance expert*. User knowledge is expertise that is understood to be the designer's. The picking work and fitting work that is involved in knowing about the user, is not made explicit but enacted as the natural expertise of the designer. The advantages of flexibility within the picking and fitting work to find information wherever needed, and the resulting benefits for the designers' negotiation positions within the innovation games, are not immediately visible.

4.3 DESIGNING A SOLUTION

The order of production is made up of the locations and positions of entities. Designers make moves within the unfolding orders of the innovation games that may result in establishing good positions for themselves. In the previous section, I reviewed how designerly facts are made in design practices, as part of making moves and negotiating the order of production. In this section, I will investigate how designers continue to make moves, and how designers are moved by design activity.

When designing digital products and services, designers imagine, anticipate, and make sense of the future use and experience of these. Wright et al. (2003) identify the "four threads of experience" that designers try to make sense of when designing (pp. 46-48). The "compositional thread" is the "structure" in which the narrative of possible action, reasons, consequences, and explanations is created. The "sensual thread" takes care of the "look and feel," and a person's "sensory engagement" such as feeling a sense of belonging or unease and awkwardness. The "emotional thread" that is made up of feelings such as "anger, joy, disappointment, frustration, desperation […], but other more subtle things […] are fulfilment, satisfaction, fun." The "spatio-temporal" makes sense of the engagement with time as for example as the "present" and the "future," and with space, which may involve "boundaries between self and other," or private and public space.

Other authors emphasise other aspects of the sensemaking activity of design. Many authors in design concern themselves with visual perception and with how humans perceive shapes (Lidwell et al., 2003*; Weinschenk, 2011*). Books speak of "gestalt" principles which describe how humans make sense of visual information (Anderson, 2011*; Lidwell et al., 2003*). Others speak of "competitor benchmarking," where an analysis is made of the performance of other organisations' similar products (Allen & Chudley, 2012, pp. 97-103)*. Information architecture is the field that deals with the order of information and the relationships between information items, such as in taxonomies (Lambe, 2007; Rosenfeld & Morville, 2002).

Designers consider different elements when creating their design artefacts. Design knowledge is understood to synthesise many elements, and even conflicting ones, as Miriam explains. Designers are expected to have a wide range of abilities that they need to bring into a balance. Miriam emphasises the strategic and abstract thinking skills that are needed on the one hand, as well as the tangible and creative capabilities on the other.

Products in digital innovation are designed with a multitude of prototyping methods and software, and many kinds of design artefacts are produced. I will not review all methods and software in this section, but I will introduce those that will be mentioned in the field notes. As introduced earlier, the design of digital products usually involves a range of people who collaborate in the innovation games. The design of these projects is understood as informed by the human-centred analysis of a problem, although often a project is driven by other factors, such as the ideas of managers, as I illustrated in the previous section. And as shown earlier (see "3.2.4 The difficult to access user"), the user is weakly present, or even absent. The analysis of a problem and possible solutions are defined by the designerly establishing of facts (see "4.2 Establishing designerly facts"). The designers work towards these two stages, analysis and synthesis, which can also be alternated. And in Lean and Agile processes, the two stages can be cycled rapidly. This section is about synthesis, that is, the solution design for problems that were identified. This is the stage that is typically associated with what designers call making, designing, wireframing or prototyping.

Typically, before designs in the shape of mockups, wireframes or prototypes are made, the product and user experience are mapped out through various techniques. Typical is the creation of user scenarios, "imagining ideal user interactions" (Cooper et al., 2007, pp. 109-113)*, user journeys

(Allen & Chudley, 2012, pp. 183-186)*, user story maps (Patton, 2014), service blueprints (Polaine et al., 2013, pp. 91-95), customer experience maps (Allen & Chudley, 2012, p. 189)*, and other artefacts that describe the function of the product, the value for the company, and what it is supposed to do for the user. Personas (Allen & Chudley, 2012, p. 199)* or mental models (Young, 2008)* are typical artefacts that help identify and characterise different types of users.

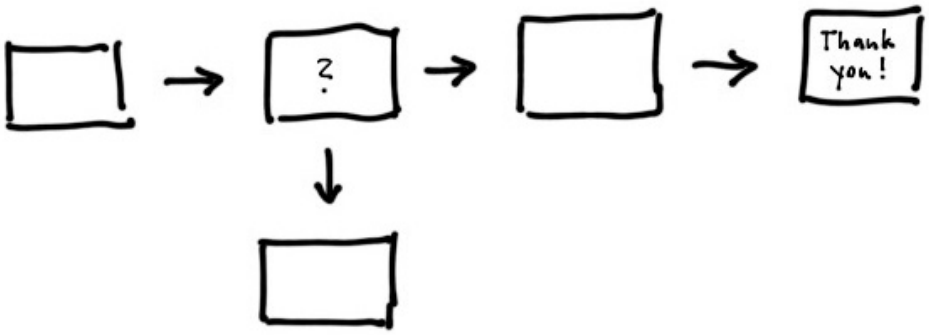


Figure 22: Schema of a user journey design artefact

Prototypes can take many forms. Designers may produce sketches (Warfel, 2009, pp. 17-23)*, or more elaborate paper prototypes (pp. 66-81)*. Prototypes may directly be built in code (pp. 151-170)* or even directly in the browser with a code-editor plugin as Olivia did when I observed her. There is often a differentiation in the fidelity of detail. Low-fidelity is a prototype with little detail, which is often produced quickly, while high-fidelity is a very detailed representation, and often used in the later stages when styles and graphic elements and detailed interactions are considered (Gothelf & Seiden, 2013, pp. 59-65)*. Different prototyping techniques and software lend themselves to different types of prototypes, different purposes, and require different skills.

Paper and pens allow for quick sketching and the illustration of ideas.

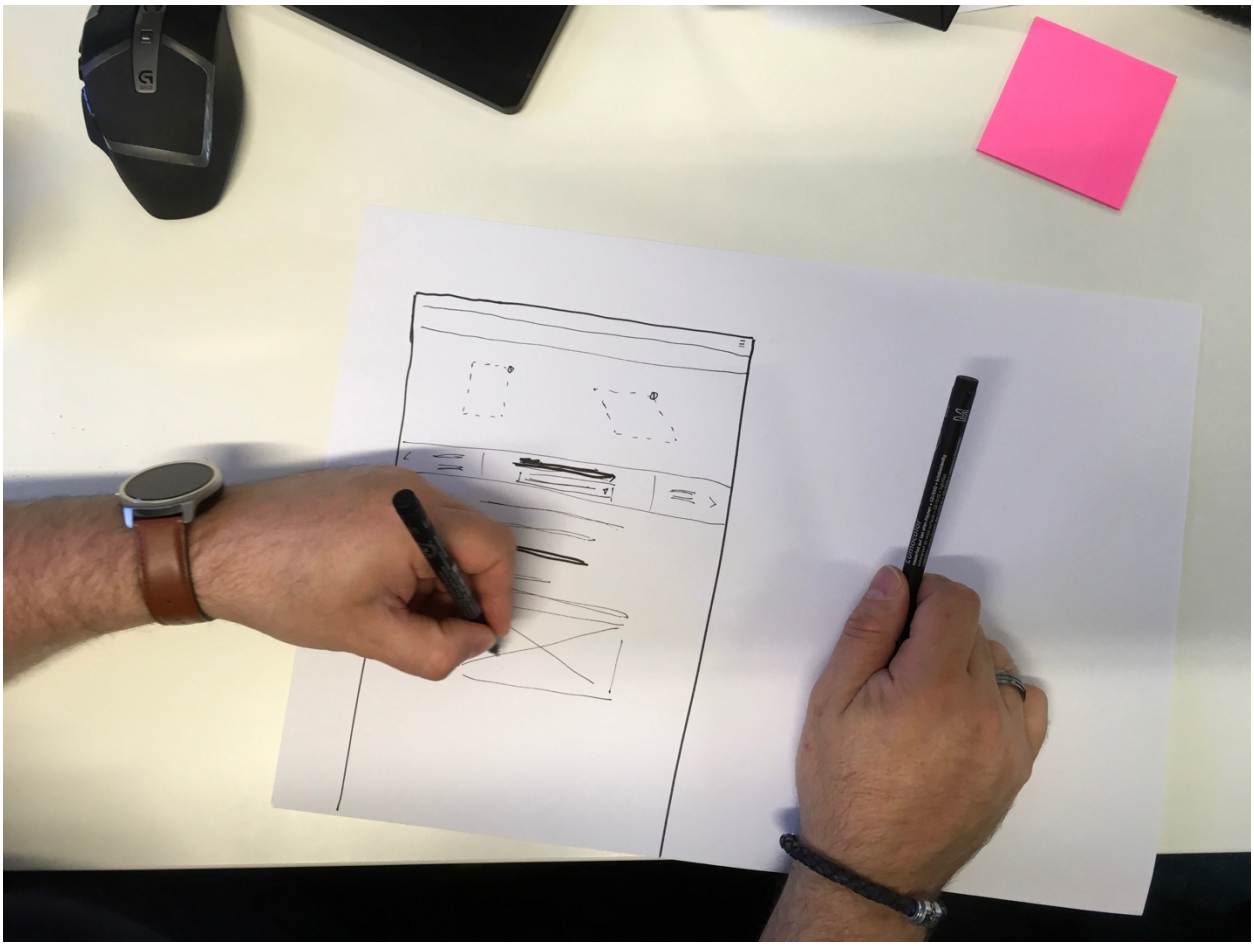


Figure 23: The designer works on a paper prototype

Many designers in my observations use Sketch, a software for prototyping. The designers in my observations have used it to design individual screens and the *flow* from one screen to the next. Sketch is used for designing the *interaction* between elements on the page, and to design the pages themselves. It can also be used for the *visual design* of pages, which is how the layout, colours, proportions and other graphical aspects look.

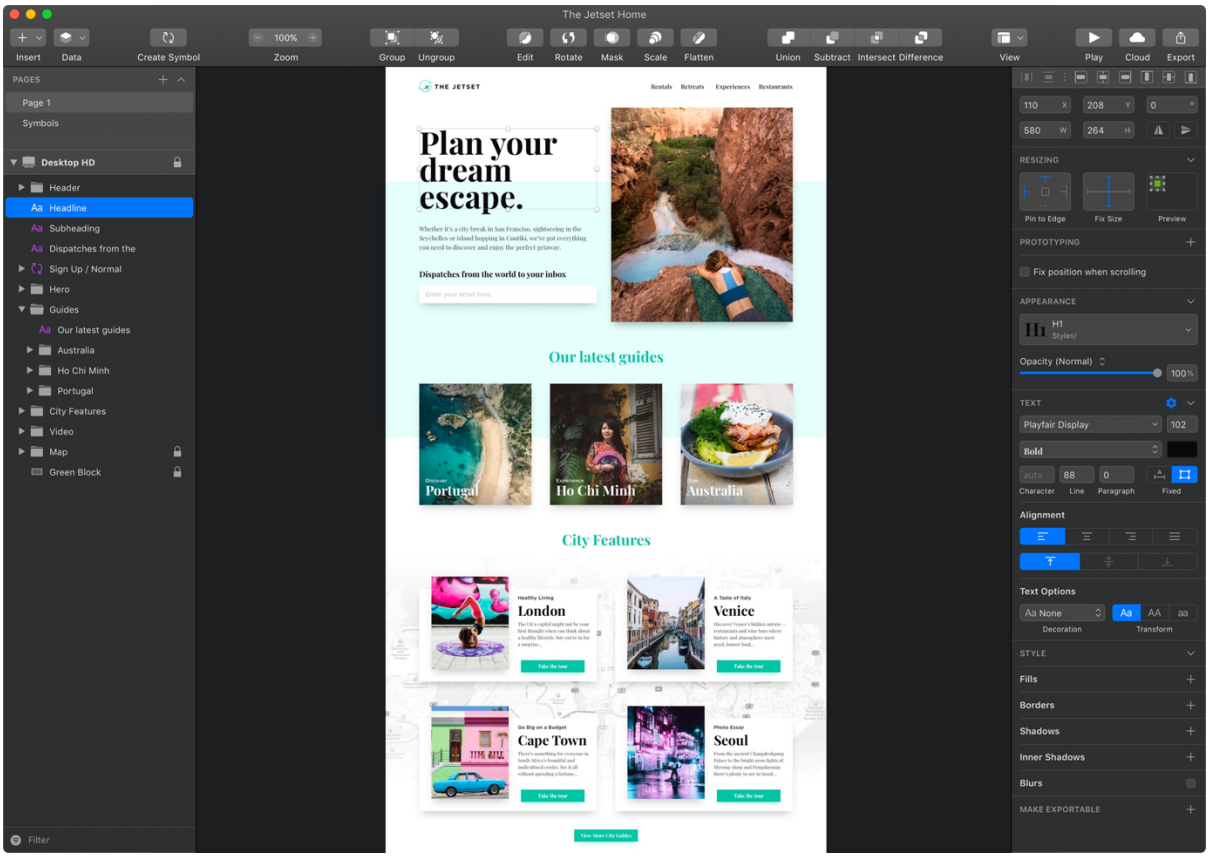


Figure 24: Sketch prototyping software, product image copied from www.sketch.com

Designing the interaction and flows of a product with complex functionality is done on a large *canvas* that contains many *screens*. These screens are digital artefacts that embody the different states of a digital product appearing on the screen of a digital device at different stages of use. In Telier's (2011) words, these "screens" are "constituents" through which the designer experiences the interactive product (p. 71). Many screens appear in different variations next to each other, and above each other. They show how an element on the screen may change ever so slightly during interaction. Or the screens may show how the same interaction may look like on different size screens, eg, on a mobile screen, a tablet, or a desktop monitor. For example, Alan, who uses Adobe XD, a software designed for user experience prototyping, works on a project that contains many screens (see Figure 25).

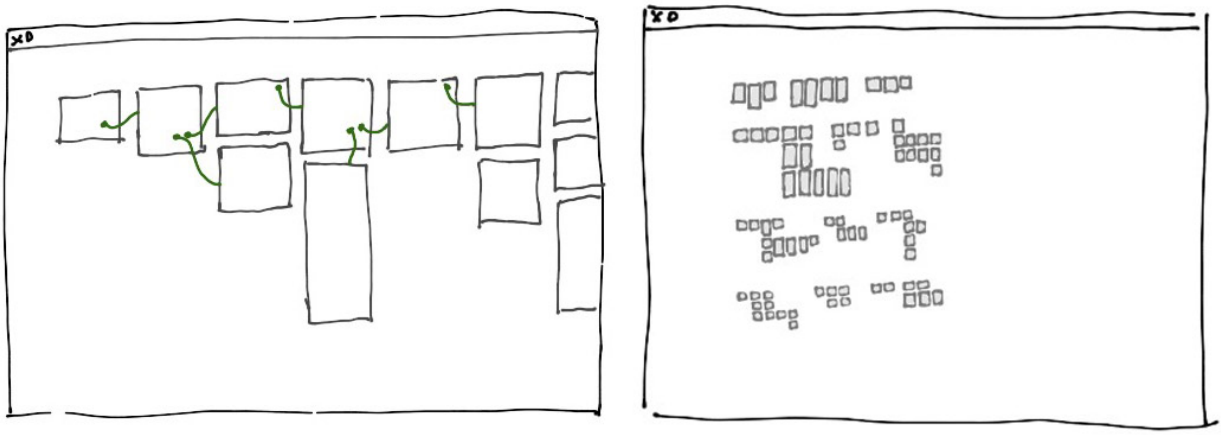


Figure 25: Left: Many screens, and right: Zooming out

Complex interactions often result in a large canvas with many, many screens. The designers are able to consider and demonstrate how the interaction unfolds over different states of use and different devices of use. During designers' work on the screens, I have often noticed them use the zoom feature. They move close-up to one screen to do some work, and then they zoom out and view this screen in relationship with the other screens. David uses the keyboard and the mouse to zoom in and out:

> While he edits a Sketch file, he rapidly zooms in and out of the canvas via keyboard shortcuts, this time using the mouse too. To zoom, he presses a button on the keyboard and draws a rectangle with the mouse over an area, which then comes close up. He copies and moves elements on the screen, gives them new text labels, aligns them, looks at them in consideration, and changes them. Eventually, he ends up with several similar looking small screens next to each other, some being different versions of the same thing (eg, only containing a different icon) for a later stage to decide upon selection for development.

It seems the zooming in and out helps designers design. It is the designers' interaction with and through the object, in which they need to alternatingly "narrow their view" and "broaden it" again (Telier et al., 2011, p. 71), in which the designers develop the relationship with the object, and in which the object comes to be. Telier et al. (2011) observed in his studio study of architects that this

“navigation” and its inherent “changing their views and their interpretations of what they are doing is very important to inspiration” (p. 75).

Each product the designers work on is different in nature. Occasionally designers work on projects with very detailed functions that need to be considered in detail. Axure, for example, is a prototyping software that enables the simulation of very complex interactions (Warfel, 2009, p. 131)*.

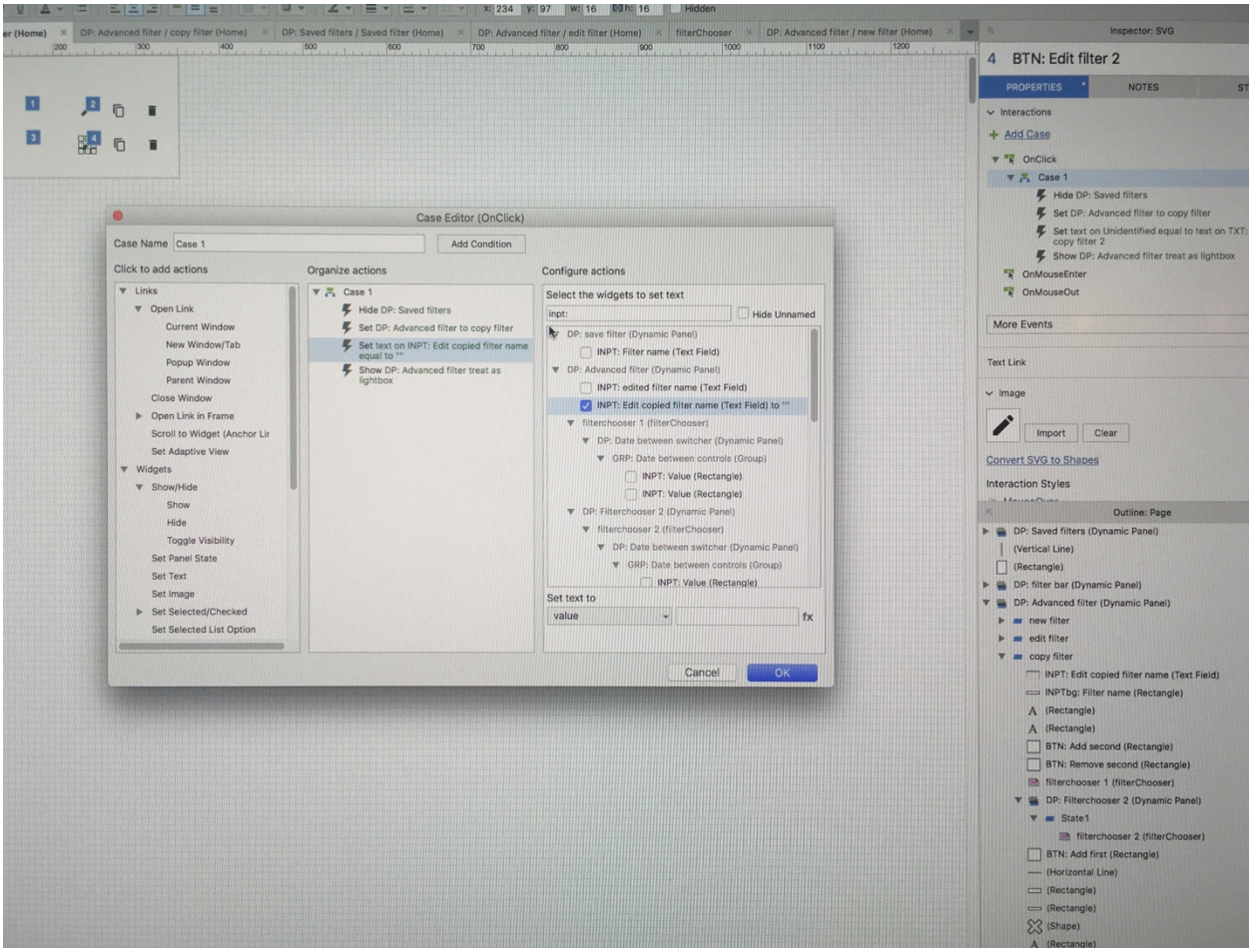


Figure 26: Lena is here using Axure prototyping software

This photograph of Lena’s screen shows her using Axure (see Figure 28), which is a prototyping software allowing for detailed configuring of interactions. Prototyping software requires the competence of the designer to be able to understand and operate the configurations of interactions, which can be very meticulous work. The configurations may describe, for example, that a select box opens upon a mouse-click, and that the selected value changes upon a further mouse-click on an

option within the open select box. Once the selected value has changed, other elements on the screen may change. In an example of a change of language, the text on the screen may change from English to Spanish. The level of detail of interaction that is possible within a page requires the ordering of these interactions and their configurations, as they work in relation to each other. Nesting and dependencies between configurations are necessary, as many actions only become possible through other preceding actions.

The interaction design of a digital product is hence a planning of future action and a configuring of relations internal to these actions – the "intra-actions" (Barad, 1998) – that come to be in the presence and in and through the intra-action with the designer.

4.3.1 THE USER INTERFACE (UI)

An important cluster of relationships within the innovation games is that of the user interface (UI). Although designers design objects, the building of them is left to the engineers.

Designers create representations of an object in which they make sense of the compositional, sensual, emotional and spatio-temporal aspects of the object (Wright et al., 2003). These representational artefacts describe the object and may consist of user journey maps, wireframes, mockups, or interactive prototypes. Much detail goes into the representation of the user interface (UI), which describes the relation between body, object, and action (Bonsiepe, 1994, p. 29):

> *"The interface is the central domain on which the designer focuses attention. The design of the interface determines the scope for action by the user of products. The interface reveals the character of objects as tools and the information contained in data. It makes objects into products, it makes data into comprehensible information and - to use Heidegger's terminology - it makes ready-to-hand (Zuhandenheit) as opposed to present-at-hand (Vorhandenheit)." (Bonsiepe, 1994, p. 29)*

Because of the level of detail that goes into the description of objects, as illustrated in the previous section, the collaboration between the designers and the engineers is close and often tense, because so much is at stake (Cooper et al., 2007, pp. 21-23)*. In the description of the UI, a negotiation takes place in which designers create a specification that "balances user, business, and technical

requirements," and the engineers are then concerned with the "construction process" of the technical infrastructures and software code, following the requirements.

There is generally a separation between *design* and *implementation*, as mentioned in section "3.1.1 Bridging problem and solution." Some minimal parts of software code may be written by the designers, but this is usually only the code that deals with the look and feel of the user interface, that is, the HTML[20] or CSS[21] code. However, the majority of the designers do not write code at all, in my observations.

Dourish (2017) has written an extensive work on the materiality of digital technological infrastructures, and how local software code is rendered through a vast network of servers and cables. Digital information is displayed by the local devices in use, such as computers, mobile phones, or tablets, which are in the hands of the users. These local renderings of screens, of which the shorthand is *the UI* of a software program, are constituted through the technical infrastructure and the dependencies between designers and developers that "bleed through" to the UI (p. 202). This constitution of the UI is made up of many interrelating factors. If a server is down, the user may not be able to see the UI, or the UI may show an error instead of the expected content. If the code has a bug,[22] the user might see something unintended. If the UI works in Safari browser for Mac, but not in Google Chrome browser for Mac, the user on Google Chrome browser for Mac will not see the UI or will see it jumbled up. If the designer was not able to get the developer to put the link to the contact page on the screen, then the user might never find out how to contact the company. If the user is blind, and the web content is not made available to the assistive technology of the blind, then the user will not be able to read the content. The relationship between the user and the interface is configured amid a "deeply mutual constitution" (Suchman, 2007, p. 260). Considering that the interface as it *faces* the user has been constituted by a complicated configuration of designers, prototyping software, developers and technological infrastructures, a *user interface* may be seen as

[20] HTML is a markup language which describes web documents. These web documents are rendered and displayed by web browsers on devices such as computers, mobile phones, or tablets.
[21] CSS is a style sheet language which describes the appearance of elements written in HTML, for example, the colour, size, widths, margins, etc., and in later versions also animations such as moving an element
[22] a bug is something that causes the code to not run as intended

very dense configuration of relationships within the innovation games by the time it renders on the local device of the user. The UI is constituted by relations between design, implementation and use.

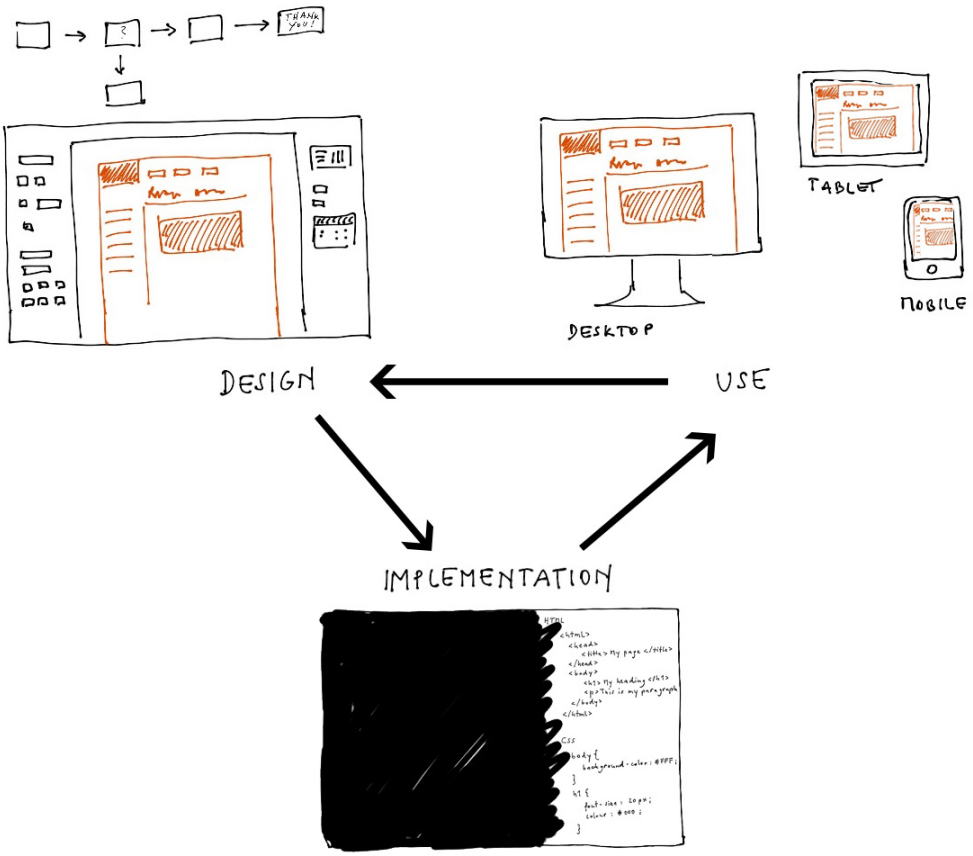


Figure 27: The relations of the UI: Design, Implementation and Use

Despite the *global* constitution of the UI (Dourish, 2017), there are two *local* descriptions of the UI within the organisation. The local description of the UI happens once in design, through the prototyping software, user journeys and other representational artefacts of the object, and once in the implementation of these specifications by the engineers. However, instead of viewing them as two linearly dependent stages of organisational process, in sociomaterial practice, these may be seen as two potentially conflicting descriptions of the UI that negotiate in their intra-action the constitution of the UI. This is part of the local negotiation of the innovation game, to create the description of the UI together.

> Gerald works on an expert review of an existing website of his organisation. The expert review includes the review of competitor websites, defining what works well in each of the sites, and what doesn't. The aim is to create a catalogue of improvements for their own website. Gerald takes notes on the cookie messages[23] which appear, which he thinks are not good. He reviews a page on investor information, which he thinks does not add much value, and should be placed on a secondary level of the website navigation. He also reviews the use of some charts to illustrate information but deems them to be inappropriately technical. Gerald continues with the expert review where he evaluates parts of websites according to their value and effectiveness. This is part of his work as a designer.

Gerald makes a description of the UI in which he defines what is wrong with the cookie messages, with the investor information, and with the information charts. Note the language of review and expert. Gerald negotiates a position for himself where he can make the description with authority. In another setting, Lena and her colleague Jules review the UI for creating reports in their product:

> They discuss the new filtering feature. They use the technical terms of search technology. *AND* and *OR* are search operators which connect key words and define whether two words build a search key together, of if they build two alternative search keys. The two designers come to the conclusion that it is a problem how the search parameters are used in the UI: "that's the problem with the AND." The two designers have a clear idea how the search operators would need to be used.

Similarly, Alice evaluates a search functionality:

> She opens the application she is evaluating and uses these terms as search terms in the filters provided. In the search functionality, she enters "[Legal expert]" "OR" "[Corporate Lawyer]." The application returns zero results. She enters "[Legal expert]," and the application returns a list of results. Alice takes a note in her

[23] A cookie message is in this context a popup window which asks the user if some information about the current use of the website may be placed on the user's computer

> notebook. She now enters the third search parameter - "UK." The application suggests "Ukraine" as a Location. Alice makes a disapproving sound and takes a note in the notebook. The application does not behave in this instance as Alice thinks it should.

Alice documents in her notes in what ways the application deviates from her expectations. An expectation is an anticipation of something. Alice anticipated UK to describe United Kingdom. This would have been the correct version of UK in her eyes. Alice makes a description of the object as she deems it to be correct. In the following, I speak with Jack about taxonomies and the order of things. I had observed him ordering many items into categories that he had made. I asked him how he knew how to sort the items.

> Jack tells the that he usually firsts sorts "taxonomically." By this, he tells, me he means how things belong together "technically." For example, "awesome" and "awful" technically stem from the same word ("awe"). Second, he would organise things "colloquially," or "how people understand things." He makes a distinction between the technical and the colloquial order, and when he has completed the ordering, he understands the order to be complete.

Jack differentiates between two orders, the technical order, how things simply are, and the colloquial order, how people use things. There is an acknowledgement that there are several ways of describing things. When making visual design considerations, there are many possible ways of ordering things. Many descriptions are possible, and none stands out as a correct one. I join Charlotte and her colleague Frank in a review of a UI design:

> They discuss the placement of the "back" link on a page with a data visualisation. Also, prominently on this page is a "word" describing the current data visualisation. Charlotte says that she is not sure to have "the word like that … floating around" in the "white space." She means that it might be a problem to have both the single word and the "back" button positioned next to each other in the top left corner of the rectangular data visualisation. Frank responds that it is

> "more visible in the white space, than if it sits up there" [in the heading].
> Charlotte eventually agrees: "Maybe I am overthinking it."

Getting lost in the top left, "floating around" in the "white space", or becoming "more visible in the white space" – these considerations reveal the multi-dimensional space of possible relations. Possibilities are revealed as far away from right and wrong. They can go anywhere. Designers are aware of their impact on whether users are able to navigate their products and its functions. *Don't make me think* is one of the books in the designer library which reminds designers of the many possibilities and constraints which come to bear in the everyday paths which users take through their products (Krug, 2005)*. It is what designers choose to see and problematise, which becomes part of the description. Haraway (1988) reminds that such object descriptions are "boundary projects" in which "siting (sighting) boundaries is a risky practice" through which practitioners participate in "unequal structuring" (p. 595). Furthermore, whilst *siting* and creating the description of the bounded object, designers position themselves as "indispensable [to this] problematization" of what its preferred description is (Callon, 1986). A stabilisation of positions and relationships between team members is achieved in the activity of de-scribing of technological objects (Akrich, 1994).

> When Olivia reviews the code implementation of the survey opt-in, she knows that the business would like this opt-in to increase the response rates of users. But she wonders about the best thing to do for the user. She looks at the UI which the developers have coded, and she wonders about the effects of it. She is not convinced about what the developers had done, and says, "This is a typical thing where a developer goes 'We just tick this box,' but we need to make sure it's OK."

The designer enacts a position of being able to make "OK" and to correct what the developers had done. Here, the developers are not able to do that, while the designer is. Designers describe preferences when they problematize object relations, such as describing what is "OK" and what is not "OK." Designers enact their indispensable positions within the descriptions, for example by making to-do lists for the engineers:

> While I visit David, he works on reviewing a UI which has been coded by the developers. He explains to me that the developer has deployed the code to the

> UAT environment which translates to user acceptance testing area. In the UAT environment, David can check everything was implemented correctly. David logs any deviations from expected behaviour as bugs in a Google spreadsheet. This spreadsheet will later serve the developer as guidance to make changes and adjustments to the code.

As I have demonstrated, designers consider many relations in their descriptions of the object in question, such as its value, effectiveness, related business and user needs, visual meanings, technical meanings and colloquial meanings. Designerly knowing is enacted as the description of objects in which many relations are synthesised. Designers also care to make things "OK" and reinforce their description of designs, made indispensable through their positioning in problematising and bounding the relations of the object, through reviewing, evaluating, comparing, taking notes and compiling to-do lists for developers. A separation and hierarchy are created in the description of the UI through locating those who know and care (the designers) and those who don't (the engineers).

Designers deal with a multitude of different aspects when they create their description of the UI. It is a negotiation in which the user features heavily, as well as visual design aspects, business considerations and technical meanings, such as search logic and word stems. They locate themselves as the ones who know, and the engineers as the ones who must follow.

By separating the implementation of their designs, designers locate engineers to be responsible for the technology as a knowledge entity. The technology is isolated as what needs to be tamed, by replacing its natural technical inappropriateness of complicated search parameters and taxonomies and with a description embodying the synthesis of taking all aspects into consideration. In the eyes of the designers, the knowledge entity of design takes precedence over the knowledge entity of technology. In the enactment of design, designers are able to synthesise many different knowledges and take a position of design competence. They thus demarcate the engineers to be the ones being given to-do lists, told what the correct order is, and what is OK to do in the UI and what is not.

In the separation between design and implementation, the designers are in the advantageous position of being responsible for the human knowledge entity. The separation may be seen as a move in the innovation games, renegotiating orders and positions of knowledge entities. Only through the separation can a hierarchy between the two be introduced, and this may be the function of the

separation, in which designers reinforce their positions as responsible for the human aspect, likely to enjoy primacy from a human standpoint. Separating design and implementation has isolated technology as the entity over which the designers' descriptions dominate.

4.3.2 THE NEGOTIATIONS BETWEEN DESIGN AND IMPLEMENTATION

Digital products are hardly ever built from scratch. The work is often based on existing digital platforms, an extension of existing platforms, or additions of features, and new products often utilise libraries of existing solutions. "Design patterns are a means of capturing useful design solutions and generalizing them to address similar problems" (Cooper et al., 2007, p. 156)*. Designers collate these patterns into libraries that can be reused at will. Pattern libraries are collections of reusable UI (user interface) components (p. 149). These libraries encompass navigation items, such as menus and links, form elements, such as text input, yes/no options, or a selection dropdown. They may also contain grids for a consistent layout of pages, such as a small left and a wide right column, or three equally wide columns. Also, behaviours may be defined in a pattern library, describing how elements behave when a mouse cursor hovers over them or clicks on them, and, for example, initiate a change of colour. But no software interface can be built from a pattern library alone "in cookie-cutter fashion, without knowledge of the context in which a pattern will be used" because "the core of each pattern lies in the relationship between represented objects and between those objects and the goals of the user" (Cooper et al., 2007, p. 157)*.

Libraries can also be purchased or downloaded and adapted for the project. These acquired pattern libraries then need to be adapted to the local needs, such as the organisation's branding and style guides. Bootstrap is a widely known pattern library that is mentioned several times in the job adverts for designers. Bootstrap was created by designers and developers at Twitter, originally for the UI of Twitter, and later made available openly to the software development community[24]. The following example is the pattern of a "dropdown". The screenshots are taken from the Twitter Bootstrap documentation site[25].

[24] https://getbootstrap.com/docs/4.1/about/overview/
[25] https://getbootstrap.com/docs/4.3/components/dropdowns/

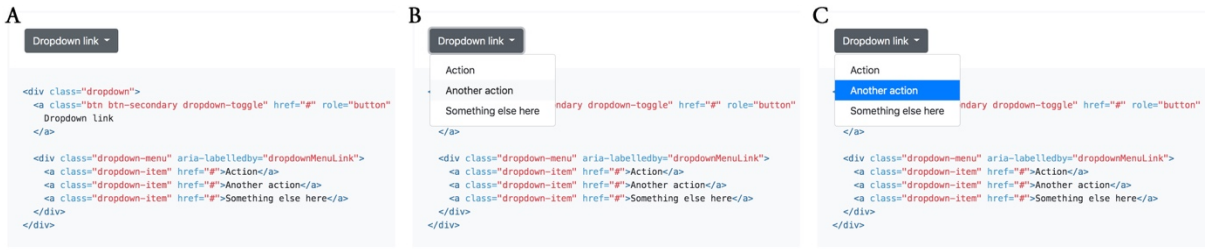


Figure 28: The dropdown component from Twitter Bootstrap, A) closed dropdown, B) opened dropdown through mouse-click or finger tap with options visible, and C) clicked or tapped option

The screenshots of the Bootstrap component "dropdown" show how a design pattern is made up. The dropdown is a button-like link that opens a box with options to select. This behaviour of the button and the box and options are described in the pattern. It describes what users see, feel, and interact with. This pattern is described *visually* – this is how it is included in designs. And it is described through *code* – this is how developers use it.

The designers in my study worked with pattern libraries. How pattern libraries are integrated differs in every organisation. Library patterns are an effective way to describe how the user interface looks and behaves. Although the look and the behaviour are usually the designers' responsibility within the organisation, the code itself often is not. Designers will collaborate closely with developers to negotiate the cross-dependencies of these UI components. Usually, the nature of their collaboration is that designers define what the user interface looks like and how elements behave, and the developers write the code to correspond with this definition. However, this collaboration between developers and designers entails a whole process of activities. The designers need to communicate to the developers how the UI is supposed to look and to behave. Designers usually hand-over a design prototype that developers turn into a code implementation. However, this handing over is part of a negotiation between the designers and the developers.

I will illustrate the example of Charlotte, who defines the pattern library in Sketch. The software developers define their version of the pattern library in code. Charlotte's Sketch pattern library describes all components used in the various UIs of the organisation, such as the formatting and

styling of headings, links, buttons[26], drop down boxes[27], etc. Every detail of these elements is defined. The sizes, colours, borders, etc. The pattern library feeds the product's UI design. But not only that. The pattern library contains representations of all elements that re-appear in the various products' UI designs within the organisation, so a pattern library describes the UI design of many products. It is a global description of UIs, which can be locally overridden for each UI separately, or even for different instances within one UI. The global pattern library serves to keep a consistent UI design for all elements that are reused over and over again. When an element in the design changes, this element needs to be updated in the pattern library, and it should thus ensure a consistent updating in all related UIs. Such a change would be initiated by Charlotte making a change in her Sketch file. Charlotte then hands over the updated pattern design to the development team, and the development team makes changes to the code pattern library, which is the equivalent of Charlotte's Sketch library in code. Because of the way code libraries are built, not all changes are possible without affecting other elements (see Figure 31). Therefore, Charlotte is not completely free in the definition of the pattern library.

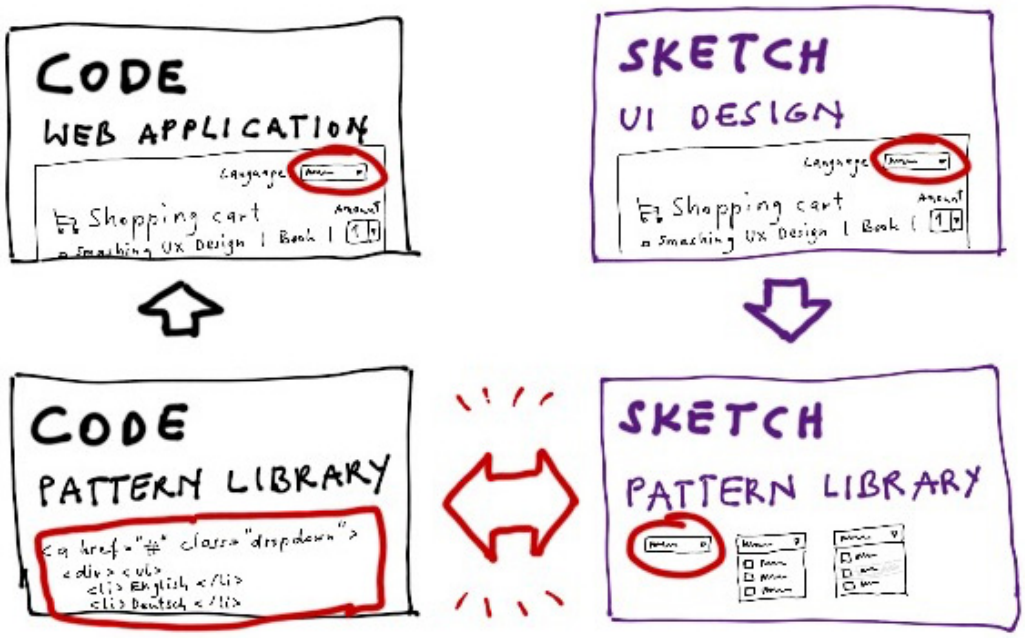
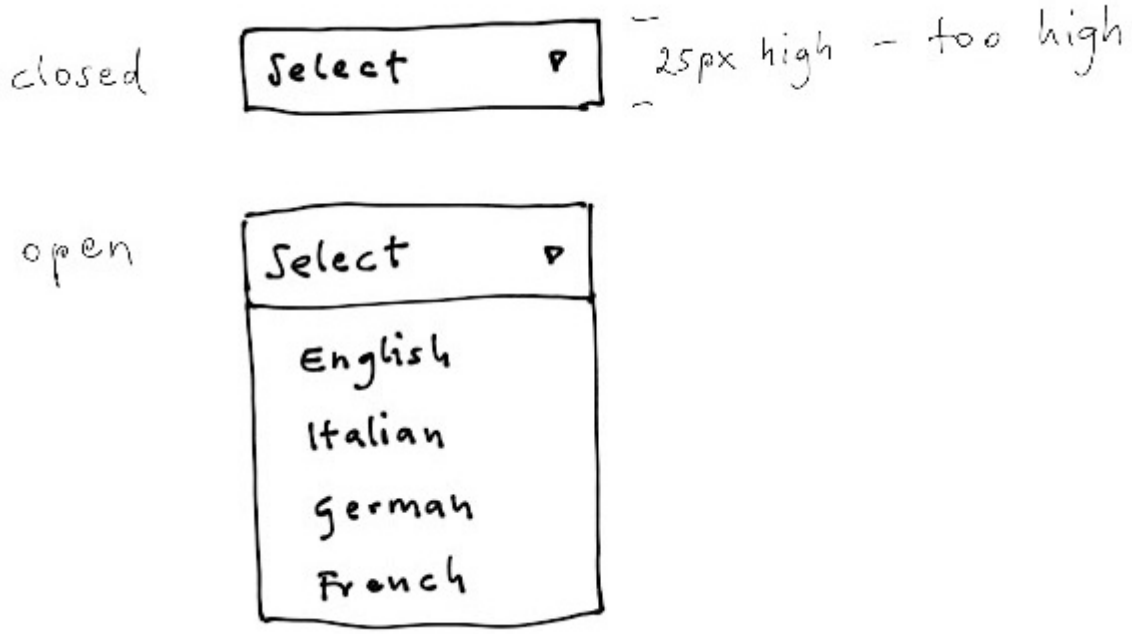


Figure 29: Organisational pattern library practices

[26] Buttons are web links which are graphically displayed as if they were physical buttons on a machine
[27] A drop-down box is a choice of several options which expands (usually downwards) as a list when opened

Charlotte and Alan would like the drop-down box to be a bit smaller because it would look better in their eyes. However, as they discover, this isn't possible because the opened drop-down box contains items whose heights are, because of how it is coded, tied to the height of the default state (the closed state) of the drop-down box. While a smaller closed box would make the element look better, smaller items in the open state would make it look odd.

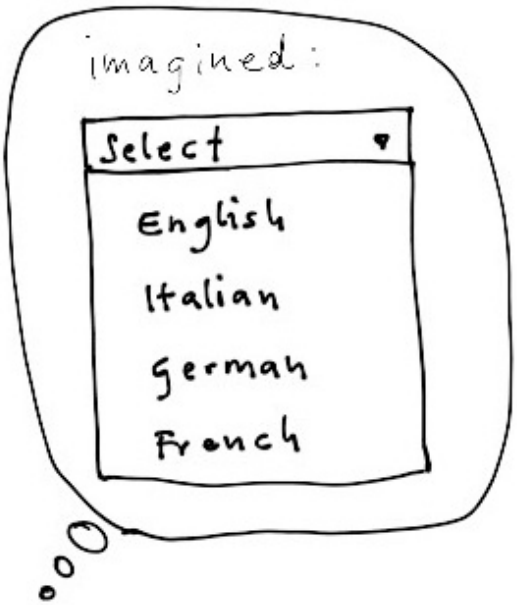
> The drop-down box is too large for Alan and Charlotte in its closed state. Alan says, "The smallest they do is 25 pixels[28]." He finds this too big still.



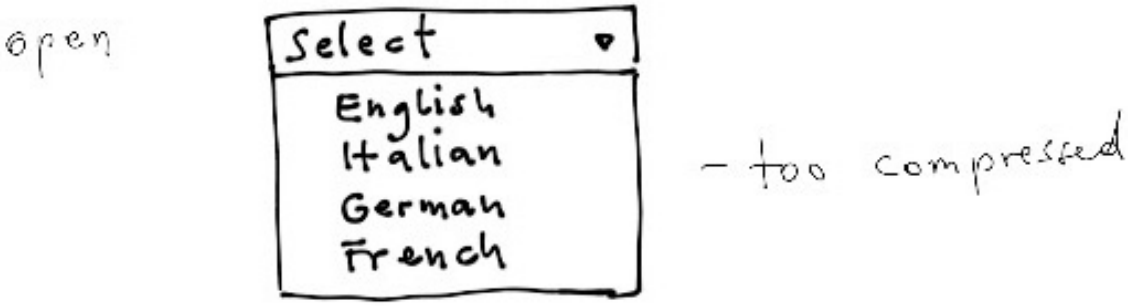
> Alan asks if the closed box could be made smaller.

> He imagines the following:

[28] A pixel (px) is the smallest unit on a display screen.



But the issue is that this imagination doesn't work with the code. Charlotte explains, it would look odd when the drop-down box is opened because the height of the options in the drop down would not be high enough. She echoes what the developers said, that the height of the "select" and height of the options are tied together. So, the open box would look like in the following image:



This version is not an option for Charlotte and Alan. The list of options looks too compressed. Therefore, they decide not to request the change of the pattern. Charlotte: "Let's go with the regular one because it makes more sense with the dropdown."

It is visible how the "dropdown" UI component that the designers seek to describe is not possible with the code UI. Alan and Charlotte have a particular change in mind – to make the height of the drop-down box in its closed state smaller, but what they cannot foresee are the inner workings of the code library, which will as a consequence also make the line-height of all the options (visible only when expanded) smaller. They do not want this change. The designers, therefore, give in to accepting the original height of the dropdown box closed state. The code description has won this negotiation.

According to the general idea of human-centred design, and the performing of the separation between design and implementation, the designers enact a position where they police the correct code implementation of the UI. They describe to the engineers how the UI needs to be. After the code implementation is complete, the designers review it for deviations from their description. Anything that appears to deviate needs to be changed. In the following text, David tests the UI that he was given by the developer to check.

> David is testing the code prototype, which he can access in the staging environment. David uses Google Chrome browser on the Mac – and he also looks at the prototype on his iPhone, which is placed on the desk in between himself and the keyboard (and hanging on a power cable), whilst typing in the bug[29] spreadsheet. The bug spreadsheet is made up of several columns and rows. The column titles read "No, Title, Page / View, Description, Screenshot link, Logged by, Device / Browser, Category, Priority, Severity, Approved to sprint, Status, Review". Each row is a new bug discovered which needs attention.
>
> He types "When opening the card, the opened card scrolls to the top of the viewport, immediately below the header …." What is supposed to happen instead, is that it scrolls almost to the top of the viewport, leaving a small gap to the top edge. "We would like a small border ([…] about 20px[30])."

[29] A bug is an issue in the code. It means that the code does not work as expected.
[30] A px (pixel) is the smallest unit on a display screen.

David is here making a list of issues that he discovers when checking the implementation of his original definition. He points out that the card – although it should scroll up to the top – it should do so leaving a gap of about 20px.

David engages here in the evaluation activity of human-centred design that seeks to make sure that the UI is as it should be. He writes a to-do list for the developers. At the same time, whilst checking the UI, David finds some work to do for himself too. He carries on reviewing other jobs that need to be done.

> He opens another spreadsheet, which is the "sprint board." He adds a few new items at the bottom of the list, e.g. "Make desktop experience more attractive," or "How does the experience end for the user?" These items are categorized as "UI / Design."

While checking the developer's code implementation of his design, David has identified that there is work to be done that he can do straight away. He so begins to change the design prototype, a Sketch file.

When David carries on looking through the code prototype, he continues to notice things that need to be changed. On his iPhone, he comes across a form element, a text input element.

> He now takes a bit of time to research an issue he has come across when testing the prototype on his iPhone – he notices that the text input element loses "focus" when trying to type into it: when tapping his finger onto the text input element, normally a cursor appears in the text input element, indicating that text can be typed. However, not in this case. David turns to his Mac and uses Google Search, and he finds that there is a known problem similar to his, which has been discussed on "Stack Overflow," an online community forum for software designers and developers. David also reads the "Apple Human Interface Guidelines" which define the behaviour he expected when tapping his finger on the text input element in the UI visible on his iPhone screen.

David has found an issue when testing the code prototype. He does some research to find out more about the issue and finds out that it is a common problem. In order to describe the issue to the developer, David prepares a mockup:

> For describing the issue which he discovered to the developer, David prepares an image, representing the text input element precisely how the cursor appears when tapping onto the iPhone screen. He makes a pixel-perfect[31] representation of the text input element with the cursor appearing inside, editing pixels while he zooms in and out of the Sketch document until he is happy that it is an exact representation.

In this unfolding of activity of checking the UI and describing what needs to be done to change it, David makes a description of the UI which he expects to correct the developer's. A separation of design and implementation is enacted. This enacted separation makes visible how the two versions compete.

> *"[…] the singularity of 'the interface' explodes into a multiplicity of more and less closely aligned, dynamically configured moments of encounter within sociomaterial configurations […]" (Suchman, 2007, p. 268).*

The dropdown UI component manifests in the negotiation of Charlotte and Alan with the developers. The moment of encounter when the developers describe the dependency between the two heights allows the developers to dominate the description of the UI component. Although the designers enact the human-centred primacy of designerly knowing, which is supposed to specify the technology, this time, the designers did not win. Although designers create their design prototypes, they do have to work within the sociomaterial relations in which UI components manifest. The materialities of pattern libraries allow certain uses of elements and not others. The code in the pattern library did not allow an arbitrary declaration of the height of the dropdown box. A fine web of relations within which designs come to be is revealed. A text box on the mobile screen may look exactly as in the design, but it may behave differently. A page may perfectly scroll, as described in the design, but it may not have exactly the margin on the screen that the design meant to prescribe.

[31] Pixel-perfect is an expression that describes the effort of very detailed, fine work for screen designs

There are conflicting ways of describing the same thing – the text box, or the scroll behaviour. What the designer describes a text box to be, does in this case conflict with the code describing the text box.

The separation of design and implementation creates a situation of two potentially conflicting descriptions. Design describes the UI in a particular way. And the code describes the same UI in another way. However, the separation between design and implementation has also opened the games, which one of them can win. Hierarchies can be reshuffled. The innovation games enable a competition for one version of the description to win, and others to lose.

Design is understood to be defining what gets implemented. The separating out of *technology* creates a location for which the responsibility is given to the software developers. Design, on the contrary, remains in the conveniently unclear location of considering *everything else*, in the synthesis of designerly knowing. Design remains responsible for integrating all the parts, whilst assigning the location of implementing the technology to the engineers. The separation of design and implementation has enabled a hierarchy in which designers, responsible for everything, including the interpretation of user needs, are put in the better position to win the competition. The separation between design and implementation within the innovation games has enabled the negotiations around reordering orders and positions of people, things and their knowledges, in which the designers and their designerly knowledge are able to take advantageous positions. Nevertheless, it doesn't always work out this way.

Despite the separations, the entanglements between the people working with technology and the technology itself are visible. In David's testing activity, the finding of issues depends on the devices David has access to, such as his iPhone, his Mac and the Google Chrome browser. Similarly, design activities depend on the software and devices the designers are using. Clearly visible are the "sociomaterial entanglements" (Orlikowski, 2007, p. 1445) of the designers, and although the designers are competent in this negotiation with the material, they are not necessarily in control:

> Gerald now takes out of the drawers the wireless keyboard and mouse and sets up his workspace. The wireless keyboard works, but the mouse is not working. He tries for a bit, shakes it, lifts it up, clicks the button a few times, and lets it drop on the notepad, where it lands upside down. It looks a bit like a beetle turned on

its back. Eventually, he connects the mouse to the Mac for charging and puts it to the side. The wireless keyboard is still where he had put it - in front of him. But without the mouse, he needs to use the trackpad, and so his hands are already placed really closely to the inbuilt keyboard – they are in close vicinity. So, he ignores the wireless keyboard, and instead, he leans over it to use the inbuilt keyboard (and nearby trackpad).

Figure 30: Gerald's desk infrastructure

Gerald's wireless keyboard worked perfectly. But because the mouse was not working, and because he had to resort to the inbuilt trackpad, the external keyboard was rendered useless. Although only one device was not working, the situation resulted in a landscape of obstacles that the designer had to overcome. Such technical blips, were an almost constant companion in my observation of teams

at various sites and in various organisations. Similarly, designers were confronted with, and able to overcome, the obstacles of not-working Wi-Fi, intermittent conferencing software, and computers' auto correction continuously overriding their own commands.

The designer is embedded in a sociomaterial negotiation with technology that constitutes action in design. The materials "talk back" (Tholander et al., 2012). Although the separations of human-centred design and technology-bounded implementation are maintained and reproduced, material relations are crisscrossing all over designers' and developers' practices, and they tend to be ignored.

Amid the enactment of the separation of design and implementation, there are complex negotiations unfolding that seek to define locations on the one hand, and hierarchies of who tells who what needs to happen on the other hand. Designers assign the responsibility for technology to the developers and are so able to remain responsible for all the rest. The designers and the code describe two different, potentially competing versions of the UI. These are two different modalities of description that may clash. Mol (2002) speaks of competing objects that clash, with the effect that one of them will be privileged (pp. 46-47). Where David tries to describe the text box, and where Charlotte and Alan think to describe a solution for the drop down that is 25px too high, the code said something else.

Who wins and who tells who what is happening? As was discussed in the previous section, through the understanding of design being able to synthesise knowledge and centre the user, the designers are the ones who specify the design with their prototypes, wireframes and mockups, and who tell the engineers what to implement. However, it is a fine-webbed sociomaterial negotiation between the designers, the engineers, and the materialities of their practices. Although design and implementation are separated, and designers enact design as able to tell the engineers what to do, it doesn't always work accordingly.

4.4 ORDERING PRACTICES

The practices of human-centred design, as I have shown in this chapter, enact separations on many levels. Designers have an understanding of knowledge as located in people's heads, and of the separateness of this knowledge and their nature in binaries such as agile and alive versus static and lifeless, research sprints versus development sprints, making versus analysis, what technologists want

versus what people want, analytical thinking versus intuitive thinking, as well as thinking in shapes, such as in circles versus squares. Human-centred design is consistently represented as able to overcome these binaries, and able to transform these into a designerly knowledge. But this does not happen without first making up these binaries, by way of representing these knowledges as naturally different.

Designerly knowing is enacted as the overcoming of the *individual* and the traditionally managed organisation by creating an enhanced collaborative entity as a *truly interdisciplinary* form of knowing. The designer's role in making up these collaborative outcomes remains invisible. Implicit remains that designers lead on and consolidate collaborative prototyping and sketching activities, and so does Olivia's *picking* of ideas, and Jack's and Fred's *voting* based on what they thought the management would agree to.

Similarly, the user is created as a particular knowledge, which the designer is able to capture, contain, and use in the moment when and where it is seen to fit. This fitting work of user information to the production process remains implicit.

In the representation of human-centred design, design softens existing knowledge boundaries and puts them together to a coherent whole. However, in the enactment of design practices, these separate knowledge entities are produced, maintained and reinforced. Representations help make up these knowledge entities by obscuring their made-up-ness. By enacting the practices of collaboration, the boundaries of individual natures of knowing and being are reinforced, for example, the *technologist*, the *user*, the *designer*, the *finance expert*, the *manager*, or the *alive human*, and the *lifeless technology*.

The designer locates these different knowledge entities and places these within the production processes. By enacting the centring of the user as speaking on behalf of the user, the gap between production and use is widened. The designer locates what the user knows, and is able to do, as a separate knowledge entity and takes care of it within the production processes. By the designer helping along *truly interdisciplinary* ways of collaborative knowing to see the light of day with their own hands, the gap between the *individual* and the *team* is widened. The designer locates what the team knows and transforms it to fit within the production processes.

This isolating of locations – as knowledge entities – reinforces their existence, despite the design process being understood to bring these entities together. Designerly knowing is understood to encompass and synthesise all these separate knowledge entities.

Technology and its implementation is one such location within the design process. However, *technology* is so isolated and separated, rather than integrated. By way of suggesting a reality where only *implementation* deals with the materiality of technology, a hierarchy is introduced between the *designerly knowing* and the *implementation of technology*. Engineers are here assigned the location of dealing with technology. To recall, technology is the thing over which design means to reclaim domination, on behalf of the human (see "3.1 Making the case for design"). This strike is done by, in a first move, isolating technology and giving it to the engineers to deal with, whilst, in a second move, telling the engineers how to deal with it (here a 20 px gap is required, there 25px height is too much). It is a way of isolating the threat, gaining some distance to it, and positioning oneself against it. However, in this positioning-against, design is centring the human in the primary spot to win the competition for domination.

Design practices enact a reclamation of domination over technology. This is the reality that human-centred design practices perform. I will briefly take a step back in my analysis to trace how the sociomaterial relationships have made this possible. Only the locating of engineers with technology has enabled the hierarchy and attempted domination of this location (4.3). To go back another step, only the separating of who is an engineer, or a technologist, and who is a designer, in the reinforcing boundaries on separate natures of knowing, has made it possible for *the designer* to be separate from *the engineer* (4.1). And that it is thinkable that the designer can dominate technology, has been made possible through a flexible location, which design practices have created for design, of being responsible for everything else outside of what has been located. The flexible location has been effected through the representing of the designer's ability to synthesise knowledge. Locating all these roles and knowledge entities has made it possible for design practices to locate every*thing* and every*one* apart from design itself, which remains the glue and the bridge between all of these (4.3). This flexible location is further enhanced by the designer standing in for the user. Through the designerly standing in for the user as a separate knowledge entity, the designer can credibly leave

their personal location behind and flexibly mould their position within the negotiations in the innovation games (4.2).

In the war between the human and the technology, the designers as centrers of the human enjoy the primacy, when viewed from a human standpoint. Everyone, apart from the technologists and the machines are going to agree. On the surface, it would be surprising that this war hasn't already been won. But it is not about winning. The designerly performance has a purpose and a function within the innovation games. The enactment of the categories *human* and *technology* as natural obscures the labour involved in maintaining these, as well as the effects that they have (Bowker & Star, 1999; Haraway, 1991; Latour, 1993). Design enjoys an advantageous position as an effect of the performing of design practices, but this is only implicit and not visible, and therefore the games can go on. Enacting a separation between the human and technology allows a hierarchical competition. This competition is the function of human-centred design as an object and works to enable a reshuffling of orders and positions of people, things and their knowledges, in the innovation games. It is made up as a tool for the people who use it to work in their favour.

The people who use design – the designers – are going to be next in this sociomaterial analysis of human-centred design practices.

5 KNOWING, BEING AND ACTING AS A DESIGNER

So far, I have spoken about design as an object and the enacting of design in the innovation games. I have not yet spoken about the role of designers in the practice of describing and enacting the object of design. In this chapter, I will investigate and discuss what makes design the discipline of the designer and what design ability is. Design as a human-centred methodology of innovative change has claimed to open design to anyone who can be a "design thinker" (Brown, 2009). Nevertheless, I will show how design remains a tool firmly in the designer's hand, respectively, in the designer's body. I will describe how designers remain designers in distinct ways. Despite the many descriptions of design skill, design knowledge, the ability to design, and how to apply the methods of design, design remains tied to the designer and is difficult to access and use for anyone else.

5.1 DESIGN ABILITY

5.1.1 THE CALLING TO BEING A HUMAN-CENTRED DESIGNER

Designers say that their job is more to them than simply a job. They describe their wish to do good in the world. Leah Buley, in her book, *The user experience team of one*, describes her work as a user experience designer as more than a "professional circumstance," but as an "important avenue for doing good in the world" (Buley, 2013, introduction)*. The designers' quest even gets a super-heroic twist in this mission statement:

> *"villains of industry seek to deprive us of our humanity. Scientists, scholars, and designers prevail, and a new profession flourishes, turning man's submission to technology into technology's submission to man." (Buley, 2013, p. 10)*.*

Similarly, in job adverts, the ideal candidates for the role of the designer "have a passion for understanding real people's real problems," who are "advocating for end users," who can "instil user-centred thinking" in the organisation, and who will be an "evangelist for UCD." Designers are meant to "apply empathic thinking to colleagues as well as customers" and "have the ability to enable the wider team to empathise with user difficulties with the aim of building better, more user focused services" (source: JobADV). Designers need to be able to empathise with users and even

colleagues. These descriptions of the ideal designer show the necessity to be generally human centred and to be able to centre other persons within their work. This impression is strengthened in Indi Young's book, *Practical empathy* (Young, 2015)*, where she describes how designers work "in support of someone" by being "willing to acknowledge another person's intent and work with it, morphing your own intent because of the empathy you developed for the other person" (p. 39)*. Young describes how through listening, the designer can develop empathy as "a practical way to broaden your understanding or the people you hope to support" (p. 174)*. This support should span users and their aims, as well as the designers' colleagues and their shared aim as an organisation (pp. 157-169)*.

The care for people is a theme that comes out strongly in the contact I had with the designers. Jack calls it "becoming a champion for the user within my project teams" or "put myself in someone else's shoes." Lena says, "we try to be their voice, […] our job is to bring up concerns on behalf of the user." Olivia explains "if I was to define my role in relation to people, it's *advocate*, I'd say, *user advocate*; so someone who's there to basically ... you know, a user can only do so much, they might fill out a survey or give you some feedback in a session, but to then make sure that their ideas are heard and addressed in a design concept, that's my job; so, it's speaking for the user via my designs." She reminds me that as a designer "you're not moving pawns on a board, it's actual people."

Many designers in the observation-based inquiry have expressed to me that they wish to make a positive contribution to people's lives and to society in general. It was this theme that prompted me to conduct a third stage inquiry in my research. I thought that I might by chance have recruited unusually socially minded designers to my study, as so many of these quoted *social improvement*. Therefore, I conducted a survey with a wider sample of participants (Survey 2). However, the outcome was similar. Many designers referenced wellbeing, happiness and making a positive impact in the world as their motivation to work as designers. The question to which I received the following responses, by 11 different designers, was "What are your personal reasons for working as a designer or UX practitioner?"

> *"Enjoy solving problems for one day hopefully a better world facilitated by design"*
>
> *"I want to be able to make a difference."*

"To improve the world I live in and to try and find purpose in the work I do"

"Design can make the world a better place."

"[…] there is an altruistic aspect where you feel you are making the world a better place in some (perhaps small) way"

"To create things that help people."

"[…] satisfaction of making the world a better place."

"To make the world better through better product"

"It's an exciting field, and I get to improve people's lives."

"Lifelong learning and to help make lives better and more convenient"

"I like that we work on making things easier for everyday people to use. Even something silly like entertainment, or something meaningful like healthcare, both are positive changes to the world."

(Source: S2)

I conducted follow-up interviews with designers from the survey, to find out more about what it means to improve the world. One designer describes to me below what he is aiming for with his work:

"I'm very interested in wellbeing and how we can increase wellbeing, I think, people individually and perhaps society at large as well. So, on a basic level, like with user centred design, at a very basic level, it is about making things more pleasant to use, perhaps, or more enjoyable to use. People usually blame themselves when they can't understand a user interface and that can lead to all sorts of frustrations and feelings of inferiority or just anger or negative emotions. So, just on a very basic level, if I can design an interface and a user journey which works well for somebody and that helps them avoid those negative emotions and experiences then that's a good thing, and that's at a very granular level, you know. You need lots of people doing that to gradually

> *increase the sum total of wellbeing in the world [laughs]. But on a larger scale, if you start taking UX or start focusing less on user interfaces, and you look at it in the context of service design, for example, then it becomes even more interesting; like how you can better facilitate positive experiences, positive interactions between people and between people and organisations, you know. There's a lot that can be done there, you know, if you get yourself on the right project you can have a very beneficial influence on people's experience of an organisation, a service and so on." (Source: INTINQ)*

In this quote, the designer uses a particular idea of what *improvement of the world* would mean: It would mean "wellbeing" and "joy." And if this could be multiplied, he said, and more people experienced joy and wellbeing, then this would increase "wellbeing in the world." As visible in the designer's quote, when speaking about experience, often categories are made of good and bad experiences. The binary *positive or negative* has many occurrences within design practice. Often, user tests of designs and features constitute either one or the other of the binary good/bad. For example, during user tests the designer counts "likes" or "dislikes" (Goodman, Kuniavsky, & Moed, 2012, p. 430) or "delight or pain points" (p. 431). The idea about the good and the bad in design also serves aesthetic judgements about society, and how the designs fit within it. Richard says,

> *"We've tried to use design in a way that adds value to society, and the ideal projects for me are ones that you can turn around and feel proud about the value that that's given your users, but hopefully that's had an impact in a broader context as well … you know, if you're doing some great UX design for a betting company, you can be proud of the work itself, but I'm not so sure if you can be proud of the impact you've had on society. [laughs] So, in an ideal world, I think we'd all like to be doing stuff where the design creates some kind of social impact and benefit."*

In design practice, there are particular ideas enacted about the world and about society. For example, designers pick up and use what they might find good or bad in society; they judge social phenomena such as betting as positive or negative and position design work in relation to it. Accordingly, a designer is supposed to feel good or not so good about their impact on society. Designers are aware of their impact on the world, and they make ethical considerations a criterion for selecting what to work on and what not (Margolin, 1995; Papanek, 1985). There are the moral and aesthetic values

that designers make and use for their own positioning, how they might feel as designers. Within these moral frameworks, designers enact their position to be a force for good.

5.1.2 TRANSFORMING DESIGN KNOWLEDGE

"Design thinking" is described as originating from the "skills designers have learned over many decades in their quest to match human needs with available technical resources within the practical constraint of business" as the "deeply human […] ability to be intuitive, to recognise patterns, to construct ideas that have emotional meaning as well as functionality, to express ourselves in media other than words or symbols" (Brown, 2009, p. 4). Design supposedly captures the kind of ability that no other discipline captures (Brown, 2009; Cross, 2011; Dorst, 2011; Martin, 2009; Verganti, 2009). Besides science and art as distinct traditions of knowing, design has been represented as a completely new paradigm, and a *third form* of knowing, which integrates both science and arts (Mareis, 2011, p. 179). The connecting of entities is a historically textured theme in design. Already the Bauhaus has as a theme "Art and Technology: A New Unity" (Findeli, 2001). In the 1960s, design methodology postulated a systematic process as a "means of resolving a conflict that exists between logical analysis and creative thought" (Jones, 1963, p. 10). These stages are combined in a design process, where the designer moves from a problem to a solution (Lawson, 2006, pp. 38-49). However, the distinction of separate temporal knowledge states, where an initial phase of understanding the problem is followed by a phase of solving the problem has been criticised, citing the inseparable and intertwined aspects of design activity (Powell, 1987; Rittel & Webber, 1973), where a whittling down of possible solutions happens much earlier in the process than typically claimed (Darke, 1979) . In architectural design practice, designers demonstrated that they put their problem-setting routinely to test in possible solutions, which made a temporal distinction between these two states futile (Gedenryd, 1998, p. 86). Because it was so difficult to observe these separate stages of problem analysing and problem solving, the theorising began to describe design as constant co-evolving of the problem-space and the solution-space (Dorst & Cross, 2001) through a framing within the equation of a "what" and a "how" achieving a "value" (Dorst, 2011). However, these conceptualisations do not resolve the dichotomy between analysing a problem and solving a problem that remains as two distinct aspects within designerly knowing. Design ability is described as a "multi-faceted cognitive skill" that integrates different types of knowledge into a distinct form of

designerly intelligence (Cross, 1990). In design thinking, this is described as the designers' "reconciliation" between the rational and the intuitive (Martin, 2009). Consistently, the various entities described to supposedly make up knowledge are taken as different in nature.

But while theorists, such as Cross, celebrate design skill as one of the "highest cognitive abilities of human beings, including creativity, synthesis and problem solving" (Cross et al., 1996, p. 1), designers in the industry report that it is difficult to get design knowledge to be recognised as valuable. Kolko (2010a, 2011), an academic writer who also works in the industry, has pointed out how difficult it is in practice to communicate design skill to others. He adds that designers themselves struggle to describe their unique skill and that hence design skill is not recognised for what it is – to the extent that designers cannot do the work they are supposed to do. Kolko says that academia could help the practitioners with this issue of conveying to colleagues and clients what it means to design, but that there is too little exchange between academic research and practice (Kolko, 2010a, 2010b). "Buried in obscure academic journals and presented at conferences […] is a beautiful array of data related to human motivation, the human brain, the nature of cities, and the patterns of digital culture" and yet practitioners cannot use it because there is not enough knowledge exchange between them and the design theorists (Kolko, 2010b). There are doubts that designers are supported and prepared well by design education to tackle today's challenges (Goldschmidt & Rodgers, 2013). Stolterman (2008) says that there is more work to be done in the conceptualisations of design as a "human activity of inquiry and action" in order to support design practitioners.

In the following, I will look closer at Kolko's account of the problems in design practice. It is an unusual event to have a practitioner report in such detail how designerly sensemaking is understood in their practice, what issues this causes in their practice, and how it may be better conceptualised in order to work better. This account gives a lot of detailed information on the idea as well as on the enactment of designerly knowing. In a journal article, in which Kolko (2010a) draws on his own experience of design practice, he reports that design synthesis is the part least understood in design practice, with detrimental consequences for practitioners and their designs. Colleagues or clients perceive it as magic and therefore, do not take it seriously. Synthesis methods are important, he says, they "are the keys for relating research to design—synthesis methods are the ways in which ethnographic insights lead to new, innovative, appropriate, or compelling ideas" (p. 17). Kolko

describes this synthesis work as a transformation where information from different places, including the designer's own life experiences, are organised into something new and are brought together by the designers into a "whole" solution (p. 16). He describes "design synthesis" as part of a linear process following on from "design research," and leading into a "form-making" activity where the solution is poured into an "outcome" (p. 15). Focusing on the "design synthesis," in between "user research" and "form-making," he says:

> *"The designer will attempt to make sense of what he or she has learned. The goal is to find relationships or themes in the research data and to uncover hidden meaning in the behavior that is observed and that is applicable to the design task at hand. […] The artifacts developed by the designer are messy, usually drawn in the midst of deep and reflective thinking; they are sketches drawn in Sharpie, incomplete sentences, and crude diagrams lacking adequate captions or descriptions. If the beginning state (the research data) is compared to the end state (the design idea), it is not immediately clear how one derived the latter from the former." (Kolko, 2010a, p. 16).*

Kolko describes design synthesis as the designerly transformation of information, such as research data, and to find the "hidden meaning" in it. Not only the meaning of the data is described as hidden, but also the designerly sensemaking happens invisibly and manifests only partially in "messy drawings" and "crude diagrams" that are the only traces left of the work. Kolko describes how these artefacts surface as the traces of the work process – the designer's thinking "in the head" and "completely hidden from view" (Kolko, 2010a, p. 15). It is not until the "end state (the design idea)" that the order will fully emerge (p. 16). After the designer has put an order to it in the internal process of synthesising, the new order materialises as the finished product. However, Kolko explains the following issues with that process:

> *"Yet despite the acknowledged importance of this phase of the design process, there continues to appear something magical about synthesis when encountered in professional practice: because synthesis is frequently performed privately ('in the head' or 'on scratch paper'), the outcome is all that is observed, and this only after the designer has explicitly begun the form-making portion of the design process. While other aspects of the design process are visible to non-designers (such as drawing, which*

> *can be observed and generally grasped even by a naïve and detached audience), synthesis is often a more insular activity, one that is less obviously understood or even completely hidden from view. Designers may follow a user-centered discovery process to immerse themselves in a particular subject or discipline, and then go 'incubate' that material. After a period of reflection, they will produce a tangible artifact as a visual representation of the reflection. When synthesis is conducted as a private exercise, there is no visible connection between the input and the output; often, even the designers themselves are unable to articulate exactly why their design insights are valuable. Clients are left to trust the designer, and more often than not, the clients simply reject the insight as being blue sky or simply too risky." (Kolko, 2010a, p. 15)*

The problem emerges here as the lack of credible explanation of what is happening between the "input" and the "output." Therefore, a sense of magic lingers, which Kolko suspects is inadvertently created through the "lack of understandable documentation" (Kolko, 2010a, p. 16), and the lack of formalisation of what is going on during design synthesis. Designers are supposedly unable to help this impression as they do not have the conceptual tools to explain what is going on. However, this air of magic creates a significant issue in Kolko's view. Design synthesis as magic, albeit desirable because clients feel they paid for something other-worldly, causes clients to dismiss the results, as they cannot rationally understand it. Clients so "discount the value of design research and design synthesis entirely" (p. 16). Kolko contemplates that as clients reject the outcomes of design synthesis, this also renders void the preceding research. He fears that designers are then simply tasked with making things ("form-giving") rather than being involved in the crucial research and synthesis activities that create a *whole* solution.

In the tradition of design thinkers, Kolko describes abductive thinking as inherent to designers' sense-making (Cross, 1982; Dorst, 2011; Martin, 2009). In order to solve this problem for design practitioners, Kolko proposes a model based on abductive thinking as "an action oriented process that people automatically go through in order to integrate experiences into their understanding of the world around them" (p. 18, based on Dervin, as well as Klein, Moon, and Hoffman). Following Roger Martin, Kolko describes "abductive thinking" as the alternative to the "duality of the forms of

logic that have been more traditionally embraced by western society [such as] deduction and induction" (Kolko, 2010a, pp. 19-20). Abductive logic is described as follows:

> *"Consider the example When I do A, B occurs:*
>
> *I've done something like A before, but the circumstances weren't exactly the same.*
>
> *I've seen something like B before, but the circumstances weren't exactly the same.*
>
> *I'm able to abduct that C is the reason B is occurring."*
>
> *(Kolko, 2010a, p. 20)*

Further, Kolko draws on Pierce to illustrate the nature of abductive knowing:

> *"The abductive suggestion comes to us like a flash. It is an act of insight, although extremely fallible insight. It is true that the different elements of the hypothesis were in our minds before, but it is the idea of putting together what we had never before dreamed of putting together which flashes the new suggestion before our contemplation." (Charles Pierce, as quoted by Kolko, 2010a, p. 21)*

Kolko takes up the idea of insight coming to the designer "like a flash." Personal "experience" and the "heuristic" are in the idea of design synthesis elevated to the realms of "thinking" – capable of producing "insight" (Martin, 2009). Kolko continues that the information that is subject to synthesising is part "stuff I just gathered through design research" and part "stuff I know, gathered through life experiences" (Kolko, 2010a, p. 22).

> *"A design insight can be thought of as the additive of problem-specific observation ('I saw this') and personal and professional experience ('I know this'). This grounds an insight in both the subjective and general knowledge of the specific practitioner and in the objective data of the design problem itself. From a sensemaking perspective, this embraces the episodic and experiential uniqueness of the designer's memories, and pairs it with generally accepted ways of doing things." (Kolko, 2010a, p. 26)*

Kolko describes the designer's knowledge as the integration of objective knowledge ("I saw this") and subjective knowledge ("I know this"). Kolko speaks about the process taking place "in the head" of the designer (Kolko, 2010a). There is an understanding of sensemaking as a *taking in*, *storing*, and *outputting* of information. Kolko, who draws from his own design practice, speaks of the "input" and "output" of information in the design process (Kolko, 2010a).

Kolko's idea of designerly transforming is that intangible information of different types (subjective, objective) is inputted in the designer's head and then outputted as a material form. But it remains open what he means by the "form-making portion of the design process" (p. 15). Does he mean the visible user interface? Or does he mean the product as it is experienced and entangled in people's lives? Emerging objects and things come to be through being entangled with people's lives, they are "matter in flux" (Ingold, 2010, p. 8). Kolko's claim to have agency over the transforming of objects "in flux" needs to be questioned. Much rather than a "gradual progression to reality," shaping objects is full of "vertiginous hesitation, tentative moves, mistakes, miscalculated gestures, fundamental meandering, dancing," as Yaneva (2009) observed in her design studio study.

However, there is the persistent idea of designer agency. Through this notion of the designer's head as a container of knowledge, through the conceptualising the *taking in* and *outputting* of knowledge, the impression of designerly transformation is created. The designer does here transform something into something else.

The theme of the designer as a transformer continues when I speak with Miriam. She tells me about the unique skill set of the designer working in digital innovation. Ideally, a designer possesses logical skills that are needed for research and strategic activities, as well as skills in the craft of designing beautiful interfaces. She describes these two types of skills as the two far ends of a range. This skillset is not easy to find, and sometimes it is necessary to hire two people, in order to get this full range of abilities. Similarly, Richard tells me that the range of work of designers runs along strategic and tactical tasks, where more senior designers tend to cover strategic activities, and more junior designers tend to cover the tactical activities of solution implementation, but both should be able to do both types of work. Designers in digital innovation are seen to synthesise the analytical thinking of computer science with the creativity and craft of the design studio (Warfel, 2009, p. 14)*. Sophie

uses the language of "translation" where she can translate the complicated ways engineers say things into terms that lay persons can understand, by using metaphors or drawings.

> *"[…] Because it's like a translation, isn't it? So, the way engineers speak, and the way engineers explain things is very, very unfriendly to the lay person that doesn't code, and they often try to explain concepts that are actually quite simple but, for some reason, the way it's communicated makes it sound horribly difficult and what I actually found myself doing, and I still stand by this today, is develop a way of talking with engineers […] using metaphors actually, or the visual drawing on a white board". (Sophie)*

These transformation skills of designers need to incorporate two ends of a scale that need to be perfectly balanced, as Miriam puts it. Miriam tells me of the difficulty to interview for job vacancies, where she met candidates who pretended to encompass all these skills, and that she had a hard time distinguishing what they are really able to do and what they only pretend to be able to do (where they only read up in a book). In the following quote, Tim Brown, from the product design consultancy IDEO, describes his concept of these two opposing skills in balance, which he says are necessary for "truly interdisciplinary" thinking (Brown, 2009, pp. 27-28).

> *"They may be architects who have studied psychology, artists with MBAs, or engineers with marketing experience [...] people with the capacity and—just as important—the disposition for collaboration across disciplines [...] this ability is what distinguishes the merely multidisciplinary team from a truly interdisciplinary one [where you get instead of] a grey compromise [the] collective ownership of ideas and everybody takes responsibility for them." (Brown, 2009, pp. 27-28)*

This true interdisciplinary nature is, interpreting the professional combinations Brown suggests, seen as an amalgamation of the knowledge types of art with science, of art with business, or of science with business. Brown describes here a triangle, with three far ends: art, science, business. This demonstration correlates with the design innovation triad human values/technology/business as discussed in chapter 3. In Tim Brown's view, the designer synthesises at least two of the far ends of this spectrum of knowledge types.

Roger Martin is quoted as describing designers' ability as the creative transformation of "two opposing ideas" into a new, "superior" idea:

> *"They have the predisposition and the capacity to hold in their heads two opposing ideas at once. … creatively solve the tension between those two ideas by generating a new one that contains elements of the others but is superior to both" (Roger Martin, quoted in Kolko, 2014, p. 22)*

All these references express the conceptualisation of the designer being able to integrate opposing types of knowledge – binaries – into a new knowledge. In the quotation by Martin, even a *superiority* is established for this *new* knowledge transformed by the designer. In emphasising the designerly ability to transform, in explaining it as mysterious, and in making it appear as superior, I read the theme of *superpower*, which touches on the earlier image of the designer as a superhero (vs the supervillain). Design abilities appear to be mysterious and not conventionally explainable. They are also superior to other powers. A further hint at the exceptional nature of the designers' abilities is the Stanford d.school representation of designers: a photograph of two designers cycling acrobatically through the design studio, in an open hint at the extraordinary work being done in design studios.

Figure 31: Stanford d.school website screenshot offering a course in becoming a designer

The image invokes the unusual combination of a bike in a design studio, as well as the unusual way to ride it – whilst standing up. This image shows two young men, having fun and doing something exceptional and possibly daring. Being a designer is represented as a lifestyle. "Work is pleasure and vice versa" (T. Miller, 2014, p. 26). But not all this play is fun. An ethnographic study with designers at IDEO illustrated games such as "brainstorming" as negotiations around status, where

the enhancing of the status was achieved by "earning the respect of your peers [through] a reputation as a skilled and helpful designer" (Hargadon, 1996, p. 705). Not job title or official position were considered important for denoting status, but being invited to participate or lead "brainstorms" was seen as "an important indicator of overall status on IDEO's technical hierarchy" (Hargadon, 1996, p. 707). It becomes visible that games and fun activities are part of the wider practices of negotiating positions within teams. I read another account of everyday life at IDEO under this banner (Kelley & Littman, 2001). The story is full of stories between friends (all men), pranks such as gluing things to tables, special abilities such as being able to weld, drill holes, as well as acrobatic skills such as climbing onto roofs with a power cable in tow in order to get to the studio workshop (Kelley & Littman, 2001). The imagery thus created, supports, even though in a playful manner, but nevertheless plain, a theme of negotiating status and power. Design ability is understood as special, and the highest design ability is described as exceptional.

In the review of the various accounts of what the designerly ability is, the theme of uniting, reconciling, transforming, has stood out. Designers are described to be able to integrate different ways of knowing that are treated as naturally different. To recall the text in "3.1.4 The design process as a holistic device", the human-centred methodology of innovation is seen as the integration of intuitive and logical, objective and subjective, as well as individual and collective ways of knowing, and in this present section the light is shed on the role of the designer in this design activity. The designer is seen as the transformer. In Kolko's account, the corporal of the designerly knowledge may be read as the design ability being inside the designer's body. He speaks not only of the designer's thinking "in the head" and "completely hidden from view" (Kolko, 2010a, p. 15), he also speaks of synthesis as "a private exercise, there is no visible connection between the input and the output" (Kolko, 2010a, p. 15).

The integration, incorporation and transformation of types of knowledge is a key theme in describing designerly knowing. The designer supposedly does this through a bringing together of objective and subjective knowledge, rational and intuitive knowledge and through thinking (research) and doing (form-giving). Kolko (2010a) describes how through the problem input of these diverse kinds of knowledge, the designer transforms these into a solution output. In between

input and output, designerly ways of knowing are understood as residing within the body of the designer, thus to be internal to the designer.

Attempts to externalise this internal understanding of knowledge were done through thinking aloud experiments (Cramer-Petersen et al., 2019; Cross & Clayburn Cross, 1995; Lloyd & Scott, 1994), and an externalising of knowledge is understood to be possible through drawing as an expression of a mental cache (Buxton, 2007, p. 114; Lawson & Dorst, 2009, p. 114). In these accounts, design artefacts, such as prototypes and drawings, can be interpreted as representations of knowledge.

But the design literature remains ambiguous, in whether drawings and other artefacts are *representations* of design knowledge, or if designers know *through* them. The book *Prototyping* says this:

> *"Prototyping helps you get ideas out of your head and into something more tangible-something you can feel, experience, work through, play with, and test." (Warfel, 2009, p. 3)**

In this quote it remains unclear if designerly knowing is understood to be in the head of which the prototype becomes a mere representation, or if designerly knowing is understood to be in the action of creating, feeling and experiencing the prototype. The more design-oriented voices (such as a designer quoted in the book *Prototyping*, David Gray (Warfel, 2009, p. 48)*, do emphasise the generative character of drawing, in the tradition of the reflective practitioner (cf. Schön, 1983), where the designer is in a conversation with the materials to construct new things. But the remaining book, as well as the previously reviewed literature, emphasise that the drawing is only representative of a process that happens in a hidden place.

While I visit the organisation Miriam works for, she runs a sketching workshop for non-designer employees of the organisation. She proposes drawing as a form of communication, to get across ideas, whereby a mental cache needs to be expressed. The mental cache (inside the body) is hidden, and what's inside needs to be expressed through words or drawings. Similar is the account of sketching by Microsoft designer Bill Buxton (Greenberg, Carpendale, Marquardt, & Buxton, 2012), who wrote a book on sketching, comparing the activity of sketching to a "conversation" between the designer and the drawing (Buxton, 2007, p. 117). The language is here clearly inspired by Schön

(1983), but it seems that Buxton envisages that knowledge is processed in the mind, and outputted by the body in a sketching activity, whilst the result is interpreted again via a *seeing* activity in the mind. The following diagram can be seen in Buxton (2007, p. 114).

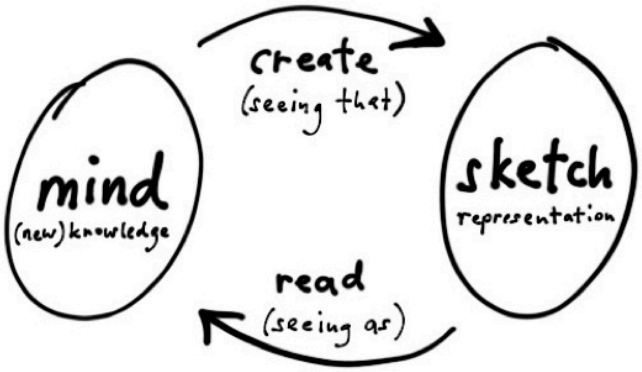


Figure 32: Bill Buxton's diagram on how sketching unfolds, retraced

While the reflective tradition of design is traceable (Schön, 1983), for example the quoted designer in Warfel's book *Prototyping*, which would describe a more generative approach to interaction between designer and prototype, nevertheless the design practitioners widely describe designerly knowing in terms of taking in (reading) information, transforming information in a hidden way into "(new) knowledge," and outputting (sketching) the information. Sketching and prototyping are indeed seen to be in conversation in the sense that the designer reads a pencil stroke and responds with a new pencil stroke (Warfel, 2009)*, but the designer is still seen as the transformer of this knowledge, together with previously collected knowledge, into new knowledge.

Representing designerly knowing as a transformation that is hidden inside the designer, contributes to making design mysterious. It plays on the old notion that design knowledge is generated by genius (Coyne & Snodgrass, 1991; Fisher, 1997) and that designers are imaginative masterminds equipped with almost magical abilities of creation" (Fallman, 2003). Instead of dispelling the idea of design as magic, which was Kolko's original concern, it reproduces the idea of design as a magic black box that only the designer has access to.

Designerly knowing is understood as a transformation of knowledge, which requires the designer body-as-head to take place. Hearing design practitioners theorise, and reading the design literature,

design ability is understood as the corporeal balancing of a rare-to-find skill range that crosses several areas of expertise, such as logical thinking and pattern-finding, as well as intuitive thinking and having flashes of insights. Designerly knowing is understood to be hidden from view, invisible, needing the designers' body as a carrier. Design knowledge is understood as an invisible substance that can be poured in and out of the designers' body/head. Design knowledge is made up of many types of different knowledges: objective and subjective knowledge, and rational and intuitive knowledge. The designer body, as well as the design artefacts such as drawings and prototypes, represent and store design ability. The material (the body, the drawing) are understood to be representatives, carriers, and the transformer, of design ability.

Designerly knowing is understood as a separation of knowledge from the material. The material is understood as a mere stand-in for knowledge. This is visible in the descriptions of the input and output of design knowledge. And it is visible in the representations of design knowledge requiring expression in order to become visible. The designer is represented as the mediator of design knowledge. Representing design ability in this way has been enabled through the separation of the human and the technology that design practices work to reproduce. I have discussed this effect of human-centred design practice in "4.4 Ordering practices". Here I have shown that this effect also serves to produce the subject position of the designer as a mediator of design knowledge.

5.1.3 EMPATHY

The designer body is understood to be the transformer of designerly knowing. Designerly knowing has been described as a process of transformation taking place through the designer body. Empathy is a key concept used in explaining this designerly taking in, transforming, and outputting. Sophie and Richard, both design managers, take care to vet for "empathy" when they hire designers.

> *"Ultimately, you can't class yourself as a 'user experience designer' unless you can express what you're trying to achieve from the perspective of the user; so you have to have, people will call it 'empathy,' you know, but some sense of the users' perspective and ideally that will be empathic." (Richard)*

> *"When I hire designers, I'm looking for high empathy, so what I just said about being able to get into the head and feel the pain of a user, for example, informs how you will design to that user." (Sophie)*

In a book from the designer library, called *Practical Empathy* by Indi Young (2015)*, empathy is described as an "understanding you develop about another person, [comprehending] another person's cognitive and emotional states" (p. 18)*. Empathy is described to give the "ability to try on that person's perspective—to think and react as she might in a given scenario" (p. 18)*. Empathy is understood as the key to being able to listen to people and to take in their experience. A large portion of the book is dedicated to how to develop listening skills and filter out the relevant details of the "fog" of available information. According to Indi Young, the user's perspective can be built up and stored as a form of knowledge. This knowledge then enables the designer to speak and work for users, in what Young calls, to "apply empathy."

Indi Young distinguishes between *developing* empathy and *applying* empathy, implying the building up of a special "knowledge" (p. 19)*. The designer can "drop in and out of [..] the empathic mindset." This empathic mindset allows an adoption of a human-centred perspective, which Richard describes here:

> *"[We should be] trying to allow designers to go on to trust the process and understand that they're going to come out the other end with this human-centred perspective on the problem that they're to solve and then their job is to be the evangelist for that, you know, to make sure that the project, the product, retains that at its core." (Richard)*

Empathy is understood to be an attribute to be found in designers. It enables the designer to take in knowledge about the user within the design process and come out the other end with new knowledge. Richard says that empathy transforms the designer into an "evangelist" – a stand-in for human-centred design knowledge. Olivia tells me with a laugh that she might enjoy the title "company empath:"

> *"[…] an even better word might be the 'company empath' [laughs], as in the world of designers I'm the 'chief empath'! I know that empathy and understanding are maybe not always the same thing and you're not always necessarily doing something just*

because you empathise with someone but having that feeling for people out there and seeing yourself through their eyes, which is what empathy is, is extremely important, […]." (Olivia)

Jack tells me how he tries to become the "persona" required to "replicate an experience" required to assess his designs. He refers to his body being able to "transplant yourself out of your own body and put someone else's personality in:"

"I think one of the key skills of a really good experience designer is to […] being able to literally transplant yourself out of your own body and put someone else's personality in whilst you're looking at the problem you're trying to solve. So, if the persona that you're trying to replicate an experience for is a 64-year-old woman who lives in Yorkshire, then you've got to think like a 64-year-old woman in Yorkshire […]. So, when you're trying to design for someone who's in a specific set of circumstances you really do need to step out of yourself and into them … you know, it's the old, 'walk a mile in someone else's shoes' idiom […], so I've got to try and think, 'What is her life, what's she focused on, what will she have experienced?,' […] so I literally step into that character; she left school at 16 and had kids, and her husband used to work in the mines, but in the 80s the mines shut down, you know, literally build a back story, be that person, step into it and then you can understand what it is they want to get out of whatever it is they're doing." (Jack)

Jack here refers to using "personas," which is a method used by designers to try and understand users within their life context (Cooper, 2004). He describes how from the circumstances of this woman's life, which he would have to establish beforehand through user research, it would be possible to understand the woman wholly, and then act and experience from the woman's place. The designer's body here is capable of temporarily containing another person's experience.

There is an assumption about the designer being able to take in user information through a "neutral frame of mind" where own thoughts and emotions are "shut down" (Young, 2015, p. 22)*. Similar to Young, Portigal describes in his book *Interviewing users* how he mutes his own expectations to

soak up the information gathered from the field (2013, p. 14)*. Portigal (2013)* describes when going into the field to interview users, to leave his "worldview at the door."

> *"As the researcher, it's my responsibility to find out what's going on; I'm not invested in a particular outcome. Even more, […] I'm not fully invested in a specific set of answers." (Portigal, 2013, p. 14)**

Portigal describes in his statement of not being "invested" in any outcomes how it is possible for a person to leave behind their own personality, in order to make space for someone else's perspective. Portigal reproduces here the understanding of neutrality that bodies inhibit. Although physically there as a body, in order to interview users, what makes a person a person seems to be able to be left behind. What the users have to say will be amalgamated and filled into the designers' body in its place.

Olivia speaks jokingly about being an *empath*. However, there is a common reference to being a *medium*. Jack describes his body to be like a medium where he can fill in someone else's life experience. In the same ways, Portigal reproduces the idea of the designer body being a shell that can take on others' perspectives, leaving their own "worldview at the door."

On the one hand, the designer body is here described as just a neutral matter, which can take in a person's experience through empathy. On the other hand, the capacity for empathy is not understood as given to just any*body*. It is the special ability that designers are understood to have. It is, therefore, that being a mediator for design knowledge is understood to be a capacity of the designer. On the one hand, the idea of a designer body merely housing someone else's perspective, opens the humble idea of being someone else's advocate, and not having any interests of their own. But on the other hand, the not-so-humble – in fact, *special* – ability of empathy makes only the designer able to do that. Designerly knowing is represented as an ability special to the designer, despite the humble aim of wanting to help someone else. Empathy is another representation supporting the separation of human and technology, by way of separating knowledge from the body and knowing from materialising. Empathy works to reproduce the designer as a special body capable of mediating special knowledge.

5.1.4 DOING UX

Being a designer is conceptualised through the separation of the human and the technology. The separation also works to create a hierarchy, as I have discussed in "4.3 Designing a solution". In that section, I illustrated the separation between design and implementation by way of isolating technology in order to control it. I will now illustrate that even within design work, this isolating of technology is taking place, as a matter of supporting the designer in the leading position.

This thesis is about human-centred design practices. As mentioned at the beginning (see "1.1 What I mean by design"), designers have different job titles, and they have different responsibilities. A job title and a name are part of enacting a practice. The methodological lens used suggests these positionings be part of the negotiations and practices of design. There is a debate ongoing in digital innovation around experience design and how it is different from other parts of innovation work. I will include this debate at this place in the thesis, as I believe it to be an enactment of the separation between the material and the human, as a part of negotiating a position in the landscape of design.

I will describe in detail how designers in digital innovation, currently often having a job title containing *UX*, distinguish themselves from designers dealing with the *UI*. The differentiation serves the difference that designers make between design dealing with the *real world*, versus design dealing with *artefacts*, which are seen as subordinate and mere representations. The differentiation, as I will show, also serves to produce a hierarchy that is inherent in the differentiation, but also necessary for the designers in order to make a credible claim for taking a high position in the general hierarchy.

Traditionally, the work of human-centred design was about usability – or the human factor – which focused on measuring human abilities and adapting machine interfaces accordingly (Carroll, 1997; Singleton, 1974). This focus has changed. User experience talks about the pleasure, joy and fun of using digital products and services (Hassenzahl, 2004), and calls for a more "holistic" thinking about use in the design of digital technology (Hassenzahl, 2010, p. 11).

User experience (UX) has gained traction in the early 2000s as an idea in the user-centred design community. Designers have begun calling themselves UX designers. The Usability Professionals Association (UPA) have renamed themselves as the User Experience Professionals Association (UXPA) (Gunther, 2012). UX has been described as a buzzword (Battarbee & Koskinen, 2005; Scapin, Senach, Trousse, & Pallot, 2012). As a concept, UX has been criticised for being "vague,

elusive, and ephemeral," and it is seen "mostly as a countermovement to the dominant, task- and work-related usability paradigm" (Hassenzahl & Tractinsky, 2006, p. 91).

In this section, I am going to trace the phenomenon of UX, and what designers mean when they *do UX*. The Nielsen Norman group, an advocacy group for user experience, says

> *"'User experience' encompasses all aspects of the end-user's interaction with the company, its services, and its products."*[32]

The all-encompassing idea resonates with the designers who I observed. Olivia says that her work is "basically looking at the whole picture." Also, Gerald explains the all-encompassing "story" of designing a product or service:

> *"[…] Rather than being 'design for a specific moment,' it's considering the overall context and timeline of a product or service and how it fits in over time, that's the key part, I feel. So, like 'graphic design' is just design for an instant response of a person, so it's a very short experience, it's a visceral response to seeing something, whereas 'experience design' is designing for a longer period of time, of a whole journey of something." (Gerald)*

The UXPA, an organisation representing user experience professionals, focuses on the organisational benefits of UX:

> *"[…] An approach to product development that incorporates direct user feedback throughout the development cycle (human-centered design) in order to reduce costs and create products and tools that meet user needs and have a high level of usability (are easy to use)." (UXPA, 2018)*

According to this description, UX is a method for product design, which considers the relationship between the user and the organisation's product and service offers, in a way that reduces costs for organisations whilst meeting user needs. Also, Garrett emphasises the commercial benefit of User

[32] https://www.nngroup.com/articles/definition-user-experience/

experience design as an "essential, sustainable competitive advantage," and its ability to "differentiate a company from its competitors" (Garrett, 2011, p. 12)*.

There are more definitions that try to capture the makeup of user experience. A survey conducted by E. Law, Roto, Hassenzahl, Vermeeren, and Kort (2009) with 275 respondents from the industry favoured this definition:

> *"UX [is] a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (eg, complexity, purpose, usability, functionality, etc.), and the context (or the environment) within which the interaction occurs (eg, organisational/social setting, meaningfulness of the activity, voluntariness of use, etc.)" (p. 723)*

According to this definition, put simply, the user's *experience* is the effect of the person's internal state, the device, and the world, in action. And quite similarly, Hassenzahl (2010) also talks about action, calling the connection of person and world a "story" coming about through action:

> *"An experience is a story, emerging from the dialogue of a person with her or his world through action." (p. 8)*

There is an idea about user experience embracing human action, and hereby leaving behind the focus on the product as a "device," as these next definitions attest.

> *"User Experience is not about good industrial design, multi-touch, or fancy interfaces. It is about transcending the material. It is about creating an experience through a device." (Hassenzahl, 2013, p. 1)*

UX is seen to be "transcending the material", dealing with the "real world".

> *"Good UX designers are always looking at the context. That inevitably means stepping outside the screen to understand how their products are being used in the real world." (Chung, 2017)*

Garrett says, "user experience [is] the experience the product creates for the people who use it in the real world" (Garrett, 2011, p. 6)*. UX is seen as not inside the screen but *outside*. UX transcends the

material and is outside the material. UX deals with the real world out there. This means that UX distinguishes itself as dealing with the real world, versus the artificial world of artefacts. Formerly, design in digital innovation dealt with artefacts, and now it deals with the real world.

There are many different ways designers and the literature speak about experience, and Buley introduces user experience as a "famously messy thing to describe," and as a "controversial concept." The concept is fuzzy and inconsistently described (Buley, 2013, introduction)*. Next, I will look at the conditions that affect how the idea of user experience is made. The action of defining experience, done over and over again, seems to accomplish something important. But what?

As a "countermovement" (Hassenzahl & Tractinsky, 2006, p. 91) it is no surprise that UX is "controversial" (Buley, 2013, introduction)* and causes disagreement. Understood as a movement, it may also be understood as a practice with an aim and a purpose. To start with, I will take a look at which backdrop UX is defined against. Therefore, I look at descriptions that define UX against what it is not. What is UX countering?

> *"UX is not UI." (Flowers, 2012)*

The author of this blog post, titled "UX is not UI," makes a passionate point in explaining how much more work is involved in UX (24 items), in comparison to UI (2 items), and provides even a poster with the comprehensive list, which can be downloaded. UX is seen to be much larger, to have a larger range of activities, and a larger scope of responsibilities. UX is also treated as a thing that's easily misunderstood and mistaken as UI design. UX may be misunderstood because it is an "intangible concept," explains Buley:

> *"You may find that the average person is more familiar with the term UI than UX. UI refers to the user interface or the screen through which a person interacts with the computer or device. Because most people have used computers at one time or another and have had encounters with UIs that were both good and bad, they often have some idea of what a UI is, and why it matters. UX, on the other hand, is a more intangible concept that encompasses not just UI, but also the hardware, the user's context of use, and the user's end goals and motivations. That's a lot harder to cram into one mental picture. […]" (Buley, 2013, p. 14)**

Buley carries on giving an example with images of a PayByPhone parking service. In this example, UI design would be concerned with the person using the software on the phone, and UX design would be concerned with the service offering, and the effect this service has on the person, for example how the person becomes aware of the service and how it integrates into the person's life. In Buley's description, the mobile phone screen is only a small part of the user's action within the world. Thus, UIs may be understood as enveloped by UX.

The work of separating the two areas of design also concerns the practitioners related to each area. There is a distinction made between user experience designers and user interface designers. I ask Gerald why his job title is user interface designer, and he responds:

> *"UI is a sub-set of the overall process of UX design, and I have a lot of experience with UI and the visual side of it, so I have more experience in that than the more sort of research-y and strategic UX stuff, so it helps to communicate which part of the process I can be most helpful with, I guess."*

So, he differentiated UI design as a "sub-set" and as "visual," whereby UX is "research-y" and "strategic." That UI design is "visual" is also confirmed indirectly by Jack, who differentiates himself as a UX designer from UI design:

> *"I'm not trained in graphic design […] I'm not an 'interface designer.'"*

Lena confirms that UX design is a more strategic work, but that unfortunately, she is hardly able to do this kind of work within their company. She, therefore, considers herself to be more of a UI designer in this role.

> *"This is why I say we're probably more like UI or product designers because we don't have a great deal of say or sway in our [strategy] or anything like that, that's all done by the product owners."*

Alice was prompted to clarify the job advert that her company had created for her role when she applied for the job.

> *"When I read the job description I thought, 'Are you looking for a UX designer or a visual designer?', it was quite confusing, and I told them, 'That sounds a bit*

confusing,' and I told them, 'I have to make it clear, I'm not a visual designer, I work with really good visual designers, and I know what a good visual designer can do' […] 'I'm a UX designer […].' "

She is adamant that the visual design comes after UX design, and so in some sense, she is saying the same thing as Gerald – that visual design is a subset of user experience:

"[…] the visual design aspect of it comes a bit later, you first have to resolve the less evident issues of the experience, you have to make it smooth, and then on top of that you can make it look beautiful […]".

One designer tells me that there is also a difference in pay.

"Right now in London, a good experience designer/user experience architect can get a day rate quite easily of between of £400-£450 a day, so really good money [whereas] interface designers [are] only getting paid £250 a day, or £300 a day."

Also, in financial terms, UX designers earn more than UI designers.

To draw a brief interim conclusion, what all these comments have to say, is that UX deals with the real world, and UI deals with the artefacts within that real world. As such, UX deals with much more than UI, which is only a detail and a subset of the larger UX. UI furthermore deals with the material, with devices, which can be touched, and which have a visual appearance. UI designers deal with the design of these devices. UX designers, on the other hand, are concerned with the design of the real world, which spans everything, including those small devices. There is a difference in size, in importance, and in monetary worth.

When I reviewed job adverts, I identified UI and UX as two focal points. However, there was range in between, with many job adverts titled "UI/UX designer." In the following are excerpts from either end of the spectrum - one UI and one UX designer job advert.

Find Jobs | Company Reviews | Find Salaries | Find CVs | Employers / Post Job | Upload your CV | Sign in

indeed

what
job title, keywords, or company

where
city or postcode

Find Jobs | Advanced Job Search

UI Designer

House of Fraser ★★★★☆ 658 reviews - Baker Street

This job posting is no longer available on House of Fraser.

Related searches:

UI Designer jobs in Baker Street

House of Fraser jobs in Baker Street

KEY ACCOUNTABILITIES AND RESPONSIBILITIES:

- Create compelling designs and structured layouts across a diverse range of touch points that are both optimised for performance and user experience.
- A natural eye and interest in Typography and Typographic layout
- An eye for detail and producing pixel perfect designs
- Experience of working with Design Guidelines and Component based libraries, to uphold best practices and design standards
- Working closely with our Front End Development team to ensure the build is aligned with designs and being able to confidently give feedback to achieve the best possible experience
- Educating and working with other areas of the business to improve the understanding of UI Design and Customer Experience within House of Fraser
- Championing user centred design to stakeholders and the wider Multi-Channel team

Technical skills and Experience Required:

- 3+ Years of UI Experience
- Demonstrable UI design skills with a strong portfolio
- Responsive web, native app and solid digital design work experience
- Proficiency in Adobe software as well as an aptitude to learning new software quickly
- Strong experience working with Sketch
- Working with In-House and Third Party development teams
- Must be able to support all stages of a product lifecycle
- Excellent Visual design skills with sensitivity to user interaction
- Ability to present designs and speak confidently about your solutions to various stake-holders
- Ability to solve problems creatively and effectively
- Up-to-date with the latest UI trends, techniques and technologies

Key Behaviours Required:

- Self starting attitude and initiative in planning to achieve targets and objectives which deliver profitable outcomes
- Continuously and proactively improves the quality of service we deliver to all our customers, external, internal and business partners
- Willingly takes projects on with a positive attitude and consistently does more than is required
- Respects individual's views and positively contributes to a learning environment in which team members are supported and encouraged to excel
- Continually asks, how can we do better/what more could it be, and inspires others to do likewise
- Behaving consistently and with integrity at all times, realising everyone's potential to get the best possible result and live the House of Fraser values

Every House of Fraser colleague receives:

- Staff Discount on House of Fraser goods
- 25 Days Holiday plus Bank Holidays (Option to buy extra holidays)
- Birthday off
- Flexible working
- Interest free season ticket loan
- House of Benefits (Great discounts everyday essentials)
- Pension Scheme
- Childcare vouchers

House of Fraser - 12 months ago - save job - report job - original job

Other jobs you may like

UI Designer / Visual Designer
Medidata Solutions London
Medidata Solutions - 3 days ago

UI Designer
Mojito Media London NW9
£35,000 - £40,000 a year
Easily apply
1 day ago

Digital / UI Designer
Rufus Leonard London

Company Info

HOUSE OF FRASER CAREERS

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House of Fraser
★★★★½☆ 658 reviews

Hello, We’re House of Fraser Let’s face it, there’s nothing quite like finding a place to work that’s fille...

Figure 33: A UI designer job advert in London

The advert asks for the following:

> *"KEY ACCOUNTABILITIES AND RESPONSIBILITIES:*
>
> - *Create compelling designs and structured layouts across a diverse range of touch points that are both optimised for performance and user experience.*
> - *A natural eye and interest in Typography and Typographic layout*
> - *An eye for detail and producing pixel perfect designs*
> - *Experience of working with Design Guidelines and Component based libraries, to uphold best practices and design standards*
> - *Working closely with our Front End Development team to ensure the build is aligned with designs and being able to confidently give feedback to achieve the best possible experience*
> - *Educating and working with other areas of the business to improve the understanding of UI Design and Customer Experience within House of Fraser*
> - *Championing user centred design to stakeholders and the wider Multi-Channel team"*
>
> *Source: JobADV*

UI designers deal with details, pixels, fonts and layouts. They need an "eye" for their work, and they work on things that can be seen and touched.

Find Jobs | Company Reviews | Find Salaries | Find CVs | Employers / Post Job | Upload your CV | Sign in

indeed

what
job title, keywords, or company

where
city or postcode

Find Jobs | Advanced Job Search

UX Designer

Keytree - London

This job posting is no longer available on Keytree.

Related searches:

UX Designer jobs in London

Keytree jobs in London

We are looking for a UX Designer to join our growing User Experience Team.

You will be expected to question and validate our designs and assumptions through creative and effective research and also to translate your findings into sitemaps, wireframes, prototypes and beyond. You will work closely with other designers, team members and stakeholders to iterate concepts and create brilliant user experience. You will work relentlessly to tease out which design option best satisfies a user's needs.

The successful candidate will be expected to

- Design and run studies that address the effectiveness of our Enterprise solutions
- Conduct research using the latest methodology
- Communicate results and suggestions in compelling and creative ways
- Wireframing, sketching, prototyping and mocking up user experiences for digital products which are based on your research findings and user testing
- Communicate scenarios, user journeys, end-to-end experiences as well as screen designs to other teams and Stakeholders
- Identify design problems and devise elegant solutions
- Collaborate with other team members and key stakeholders throughout the company

You must be able to demonstrate the following skills and experience

- A desire to create brilliant Enterprise solutions
- 2+ years of experience working in the UX field for digital products or services
- A proven ability to plan and lead testing to help generate and validate new design concepts
- Ability to consolidate, document and present your findings into actionable information
- Proven UX Design skills and experience in using best practices to create elegant solutions
- Ability to iterate on your designs based on feedback, research and testing
- Familiarity with Agile software development processes and methodologies
- Knowledge of a diverse set of software such as Adobe CS, Sketch, as well as good experience with MS Office
- Basic HTML, CSS and Javascript knowledge for would be highly desirable

We are a consultancy so you must be able to travel to and work at Client site as and when required.

We offer a really strong team ethos and excellent opportunities for professional development. The successful candidate will possess excellent technical skills, be used to working to deadlines, will be enthusiastic and both a self-starter and a team player.

If you think you have what it takes to make a difference at Keytree and want to find out how you can develop your career further then please apply online and we will be in touch.

This is a permanent opportunity offering a competitive salary and additional benefits.

Please apply with an up to date CV.

We do not accept applications from Agencies or other 3rd Parties.

Keytree - 12 months ago - save job - report job - original job

Company Info

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Premier Group London
£350 a day
Easily apply
6 hours ago

UX Designer
Zebra People London
£45,000 - £55,000 a year
Zebra People - 13 hours ago

UX Designer
Premier Group Recruitment London

Figure 34: A UX designer job advert in London

The UX job advert asks for this:

> *"You will be expected to question and validate our designs and assumptions through creative and effective research and also to translate your findings into sitemaps, wireframes, prototypes and beyond. You will work closely with other designers, team members and stakeholders to iterate concepts and create brilliant user experience. You will work relentlessly to tease out which design option best satisfies a user's needs.*
>
> *The successful candidate will be expected to*
>
> - *Design and run studies that address the effectiveness of our Enterprise solutions*
> - *Conduct research using the latest methodology*
> - *Communicate results and suggestions in compelling and creative ways*
> - *Wireframing, sketching, prototyping and mocking up user experiences for digital products which are based on your research findings and user testing*
> - *Communicate scenarios, user journeys, end-to-end experiences as well as screen designs to other teams and Stakeholders*
> - *Identify design problems and devise elegant solutions*
> - *Collaborate with other team members and key stakeholders throughout the company"*
>
> *Source: JobADV*

UX designers deal with methodologies, with the enterprise, communication, design problems and solutions, and the "end-to-end experiences." UX design deals with the intangible.

While UI designers work with "detail, touch points and layouts," and deal with the nitty gritty of "pixel-perfect designs" and code "libraries", concerned with the "build" of a design, UX designers "question and validate […] assumptions, run studies and use latest methodologies, identify design problems and devise elegant solutions" through "wireframing, sketching, prototyping and mocking up user experiences." The above are two examples of 129 job adverts reviewed.

From the set of job adverts reviewed (Source: JobADV), there is a continuum amongst the responsibilities with one focal point at each end. On the one end of the continuum, the focus is on

responding to design briefs. On the other end of the continuum, the focus is on defining design briefs. UI designers need to find solutions to defined problems. UX designers can define problems well. Whilst UI designers "respond to" briefs and requirements, UX designers will "take a broader view" and create the briefs and requirements through "a relentless focus on our users, demonstrated by placing their needs ahead of design solutions and technology."

In summary of these descriptions, whilst UI designers deal with the interfaces only, the UX designers deal with the human experience of them. These job adverts place the UX designer and the UI designer on one scale, only with the UX designer on the high end, and the UI designer on the low end. There is a hierarchy reproduced within the design professions of human-centred design.

These accounts have told in many different ways that UX is more than UI. They have said that UX is *holistic*, deals with everything, and deals with the *real world*. They have said that the user interface is just a subset of the real world and that UX transcends the material user interface. UX is broader than the design of technological devices, it deals with the real world, whereby user interfaces are only artificially made touch points through which experience unfolds. The technology, and especially the screen, are something *through* which something else, something more important, such as human experience, is being accomplished. User experience is made up to be about more than the material ("transcending the material" (Hassenzahl, 2013)). The material can be seen and is visual, while the experience is transcendental. The material is the world *inside* the screen, and the experience is the world *outside* the screen. Outside the screen is the real world, the *natural* world, where experience happens, while inside the screen is inevitably the *artificial*, made up world that can only be manipulated in its material existence, such as its visual appearance. Graphic design is seen as of limited scope as it only deals with an *instant of tim*e, versus UX dealing with design *over time*, as Gerald said.

The differentiation made between technology and the real world (between the artificial and natural world, between the technical and human world) creates a hierarchy. The real world is bigger (it transcends the technology); one is contained within the other. Stepping outside the screen to understand how their products are being used in the real world, as said in the above quote by Chung (2017), means that screen-worlds are only a small part of real-worlds. Thus, there is a clear hierarchy between the screen-world and the real-world whereby the primacy is on the real-world. The visual

and what can be seen of the technology is understood to be limited, artificial and subordinate to UX, which is holistic, real and all-encompassing. Designers distance themselves from the practical work of "styling" user interfaces, reinforcing the distance from what ties them down in order to move "[…] up the consultancy hierarchy […] extracting them from their position as last phase surface treatments of already prescribed product types" (Tonkinwise, 2011).

The differentiation between the human and the material, or between the natural and the artificial, and the inevitable hierarchy between them, has also introduced a separation and a hierarchy between the people working with the respective association. This separation is also made in the literature. For example, the book *Smashing UX design* (Allen & Chudley, 2012)* describes the distinct and separate role "Visual designer" (p. 40)*. User experience designers are seen as hierarchically higher than user interface designers or visual designers, who are seen as hierarchically lower. The review of the job adverts has added that while UX designers tend to define design briefs, UX designers respond to design briefs. UI designers and visual designers are concerned with implementing the solution to the problem that UX has defined. UI designers are paid less, have a smaller area of responsibility, and have less of a say. The two focal points UX Designer versus UI Designer in the job adverts achieve the same separation. The practice of design creates a separation that effects a hierarchy between the different types of designer. UI designers deal with the *material*, and the UX designers deal with the *whole*. UI designers deal with the *artificial*, technological world, while UX designers deal with the *real, human* world.

By isolating the parts of design that deal with the material – the interface – the human-centred design creates a gap amongst its own practitioners. A sacrifice is made, which is necessary in order to shift at least a part of design high up in the general hierarchy. Design practice does not claim that it has by its nature a high position in the hierarchy. This would be a disputable claim, to simply say that design is worth more than other things. It would be reminiscent of design as an art form, mystic and detached from real life (Coyne & Snodgrass, 1991). The designer as a superstar, who would be able to do whatever inspiration dictated, has been challenged (Coyne & Snodgrass, 1991; Fallman, 2003; Fisher, 1997). It is not acceptable any more to appear as the lone genius, because "rock stars, gurus and ninjas" are not allowed anymore due to their "large egos" breaking down "team cohesion" (Gothelf & Seiden, 2013, pp. 7-13)*. Design thinking has opened up the design stage for everyone

by rejecting the individual and embracing the collective (Brown, 2009, pp. 25-26). Design thinkers embody this inclusion of many knowledges in what Brown calls a "truly interdisciplinary" capability of creating a solution. The synthesising of knowledge is anchored in design practices around the identity of the designer as a transformer medium (see 5.1.2). Design would with a plain claim to superiority disqualify itself very quickly from the innovation games. It would be a disastrous move after design has made such a serious advancement in proposing itself as a methodology of innovation. Instead, the hierarchy within the profession does make the higher level of design, which deals with the human experience, seem like a natural career goal that justifiably not everyone can reach. Brown pointed out that only real design thinkers can make it, and that those who are only skilled in "tangible" technical skills will be doomed to the "downstream world of design execution" (Brown, 2009, p. 27). The separation of the human and of the material in professional subject positions – even within the own ranks – effects a credible positioning of (some) human-centred designers in the upper hierarchy of the innovation games. The hierarchy within the human-centred design professions has the important effect of enabling a catapulting of some designers to the very top. The hierarchy creates exclusive places for those who practice human-centred design, and for those who can credibly make their way into the high positions of UX.

5.1.5 WHAT DO YOU DO?

There is a certain insecurity visible when talking with designers about how they introduce themselves to others as designers. Gerald tells me he did a Twitter poll to decide about his job title when he was looking for work, just before he found his current job.

> *"I did a poll on Twitter a few weeks before to ask what I should be calling myself because it's been a bit of a dilemma being a generalist; I find job titles a little bit frustrating and the trend, I would say, in Silicon Valley for a generalist like me is to nowadays to be called a 'digital product designer,' which I'm comfortable with and I think that's kind of the role that I seem to take on but it's not well known in [city] necessarily, if I'm looking for a job, so that didn't really work. So, I then started using the 'UI/UX designer,' which I always felt was a bit of a stupid title in the past but I think it's the thing that kind of describes what I do best, so I stuck with that, but it's a problem, the job title thing." (Gerald)*

Gerald found work then as a UI designer, at the organisation where I visited him. I asked him why he ended up here with the job title "UI designer," and he said:

> *"Because that's what they were looking for. Job titles tend to be, for me, what the company feels that they need and if I fit into that in a way then that's going to be my job title." (Gerald)*

Gerald ended up being flexible in what he named himself as a designer. He *was* what the organisation needed him to *be*. Anthony struggles to explain to others what he does:

> *"I'm still struggling a little bit with explaining what I do to people who are not involved. I can't say 'UX designer', I can't even say 'interaction designer.' I could say 'web designer' but that's not really a good indication of what I do. So, I tend to say that I'm a digital product designer and I design apps and websites' and that usually paints a picture for people." (Anthony)*

David is a little embarrassed:

> *"I find it a bit naff, I suppose, to use the term "UX designer" […] it's a phrase that doesn't mean an awful lot, for a start and, I don't know, 'user experience' almost seems to be a bit self-important maybe." (David)*

Olivia is embarrassed, too:

> *"I hate that question [being asked what I do]. I hate it. […] Because I think I always end up being very long winded about it, whereas it should be just a simple pitch, but I don't know why I'm bothered by that." (Olivia)*

Alice is exasperated:

> *"It's not […] like a doctor or a lawyer; everyone knows what these professions are […]. I wish our profession was a bit more established so that people could understand more quickly what we do because I don't want to have to overload people with information to let them know what I do, and I don't want anything complex. I think our job title*

is a bit ridiculous, to be honest, 'User Experience Designer,' it's not self-explanatory but, at the end of the day, that's what we do, […]" (Alice)

I have briefly explored how designers tell others about being a designer. It is not easy for them to explain what it is that they do and what their professional job title is. There is a general discomfort amongst the designers I observed, in declaring themselves as a UX designer or a UI designer. After so much effort establishing the differentiation between UX designer and UI designer and after so much effort to define what UX designers do, it seems strange that designers do struggle to declare themselves as *doing UX*.

Good designers are understood to deal with holistic situations, with the real world, and with humans, not with technologies. They navigate a strong moral framework, perform a special form of knowing with a transformative power that plays on the superpower narrative. At the same time, they conduct a humble form of understanding other people's problems, whilst putting on hold their own interests. And *good designers* make sure they are not tied down with the limited-in-scope technology, its visual appearance, and its artificiality, but instead, deal with the big problems of the real world. Designers do something spectacular. They practice an identity of superpower whilst at the same time, they practice humility and selflessness. It is a paradox. How to pack this complicated identity balancing act into a brief explanation about one's job? Short of calling oneself a superhero, it is not really possible.

5.2 ENACTING DESIGNERLY KNOWING

Designers spend most of their work time at their desks. Most designers work with MacBooks, and other Apple equipment. Some designers use stand-up desks. Designers have very different styles of arranging the equipment on their desk. Some work with the mouse and keyboard, some with the Mac-inbuilt trackpad and keyboard. Some plug their MacBook into a large monitor on their desks; others use their Mac-inbuilt screen. Some put the MacBook on a stand on their desk to give extra height to the small screen. They use notebooks, sticky Post-it notes and favourite pens. They drink coffee and water. The meet with colleagues to talk about their work. These meetings take place at desks, in dedicated collaborative areas, or in meeting rooms. In between, they chat with their nearby colleagues about things other than work. They have fun, they get annoyed, but mostly they work

quietly focused on their projects, or at least this is the aim. Some designers complain about the many meetings they must attend. A lot of the offices I see are open plan, bright and have perks for their employees, such as pastry, fruit and socializing areas. Although I do not witness studio-cycling designers, or workshops reachable through roof-climbing, there are relics of office-fun and work-as-a-life-style in the form of bean bag chairs, foosball tables, glass boxes as rooms, stand-up desks and unusual architectures that intend to encourage collaboration. Open plan offices can get very noisy, and when the designers want to focus, they put headphones on with music, white noise, or as a signal that they do not want to be disturbed. They have their phones often plugged in on the desk in front of them. They respond to family and friends messaging. Very occasionally, the designers exchange messages with recruitment agents, which is just a reminder that the designers also have economic relationships with these sites of work, where they define themselves with a singular value to the organisations.

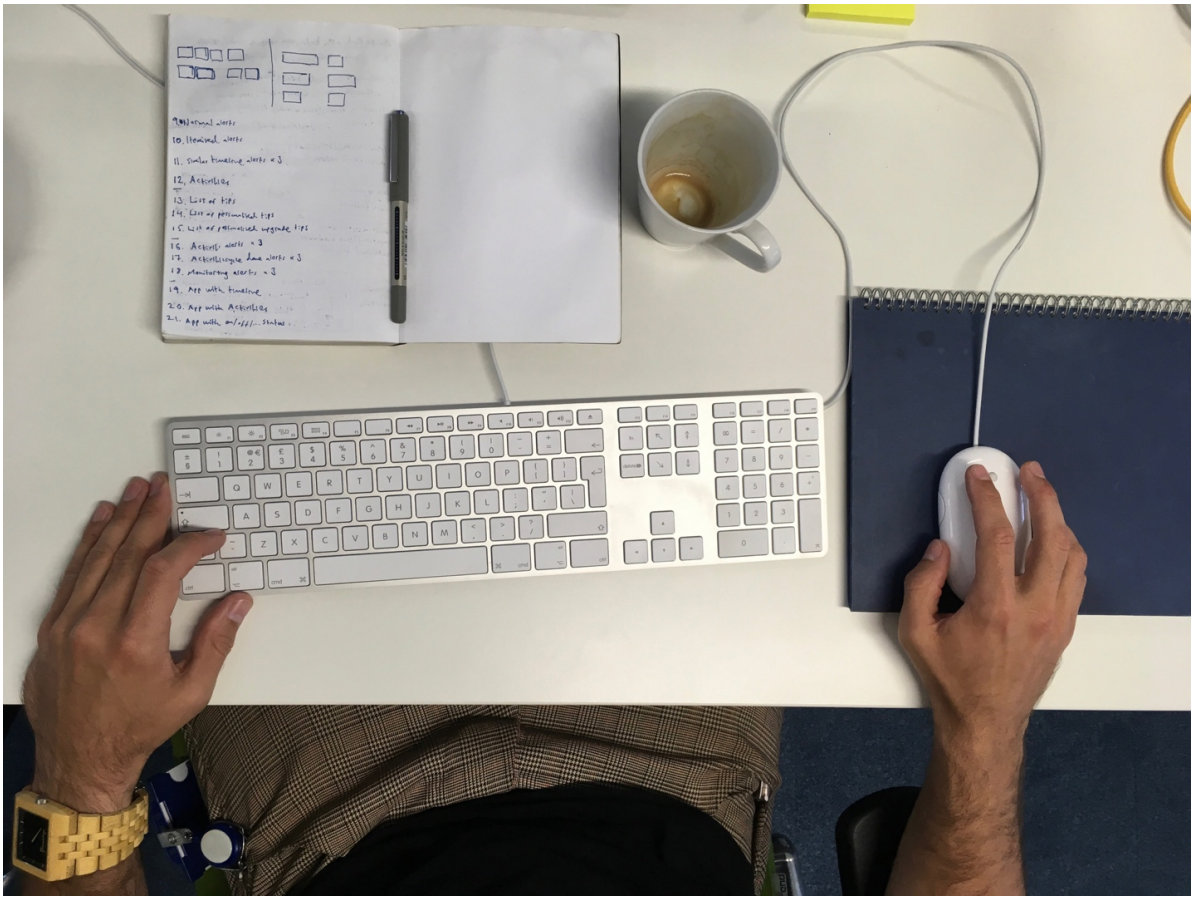

Figure 35: The designer's work desk

As the design managers told me, the designers are carefully assessed on their skills, upon hiring. But also the designers are careful about committing to an organisation. Before Anthony joined this company, he declined a job elsewhere, where he didn't like the atmosphere; he graphically explains that it was "like an old hospital, dark narrow hallways, small meeting rooms." David made sure it was a "genuine UX role, with user research," and "not a graphic design role, or a UI designer role, dressed up as a UX role," before signing the contract.

5.2.1 THE DESIGNER AS THE MEDIATOR OF DESIGN KNOWLEDGE

In this section, I will review how designing is enacted as an individual capacity by the designer. I will do this by reviewing how designers speak with each other about the designs they have created. In enacting design knowledge, it is a "common device" to speak from personal experience or from professional expertise, whilst still representing the interest of the user (Akrich, 1996).

Alice gives her colleague Josh feedback on his designs. They stand at his desk. The design is a data visualisation, and the designers discuss the text labelling of it.

> Josh proposed in his designs to adapt the size of the text according to the space available within the shape where it is situated.
>
> Alice says, "I have a problem with scaling [the text]," "even though [this quantity of data] is bigger, my eye is drawn to [the other quantity of data] because the font is bigger."

Alice points out the inconsistency: that the font size might indicate to the user that the data quantity is related, ie, a larger font means larger data quantity. She thinks that adapting the font size to the space available may mislead users into thinking the font size translates to the size of the data. The designers also discuss the "visual design," which they agree is not really their area of expertise.

> They discuss the use of colour, and *colouring by entities*, or *colouring by volume* […].
>
> Josh points out the colour scheme of one of the graphics and says that it "looks nice, in terms of visuals,"

> Alice agrees, "it is not in your face."
>
> But Alice recommends for Josh's work to remove colour and use grey scale, as to let the colours to be worked out by the graphic designers. Josh responds "Yeah, I have learnt my lesson, to not interfere with visual design." [laughs].
>
> Alice: "That becomes a visual design challenge […] You [first] solve the problem of text and data […] getting into colour should be done later."

The designers separate their area of work from the work of visual design. Although they have something to say about the colours and the graphics, the work is left to be done by the graphic designers.

Alice and Josh continue to talk about the overall layout and navigation of the data visualisation.

> In Josh's design, there are controls to manipulate the data in the visualisation along the top of the screen.
>
> Josh: "The biggest problem is height […] this is in the nature of screens."
>
> Josh means the horizontal orientation of computer screens, which leaves more space on the sides of the data visualisation rather than at the top or underneath. "This design makes better use of the space" – pointing at a design which has the navigation to the side.
>
> Alice: "That's why I like this one better."
>
> Josh: "OK, you like it as well."

Alice *likes better* the version where the user can manipulate the data visualisation on the side. Alice and Josh carry on discussing the various aspects of the designs on Josh's screen.

In another organisation, Lena and her colleague are reviewing an existing user interface, which is part of an administration system allowing users to manage reports. Lena is working on changing the design and adding a filtering mechanism. They discuss the existing interface:

> "This is not really used" – pointing with the mouse at a slider in a graph.

> "I still don't like that" is another judgement of another element she sees.
>
> They discuss together what to do about the task ahead – to come up with a solution for filtering the monthly reports.
>
> They consider different ideas.
>
> "And you can still do your search here."
>
> "And you'd get this here."
>
> […]
>
> "It has to be a vertically stacked thing."
>
> "The other way we could do this …"
>
> "Or if you clicked there and you edit there."
>
> […]
>
> "I want to see this" (hand movement with flat hand horizontal in front of the screen to indicate one row after the other, stacked down the page, in a list of entries).

In all these field notes and transcripts, the designers are using "I," "you," and "we" to express their design knowledge. When Alice thinks that adapting the font size is misleading, how does she know? When Alice *likes better* the version where the navigation is on the side, how does she come to make a choice? When Lena says that she doesn't like something, or that she wants to see something, what does it mean?

Does it mean designers express their personal opinions? No. As I have shown earlier, designers are understood to synthesise different natures of knowing, and speak about designs from special positions which encompass the synthesised knowledge entities. They take into account what users need, as well as visual design aspects and look and feel, business considerations, such as competitor and expert reviews, and technical meanings, such as search logics and taxonomical word stems. At the same time, by enacting this synthesis in practice, the separate entities are reproduced (see

"4.4 Ordering practices"). As I have analysed in this earlier section, through *locating* the separate entities, and in isolating *technology* and the engineers who are made responsible for it, the human and the material are separated.

Through this separation on the one hand, and through the occupation of the special position of synthesis on the other, design is able to *control* the description of the technology. Recall the negotiations in describing the UI in "4.3.1 The user interface (UI)", where the designers reinforce the *correct* implementation of designs by reviewing, comparing, taking notes and compiling to-do lists for developers. It is through the de-*scribing* of technology (Akrich, 1994) that the positions within the innovation games are negotiated and stabilised. Through the locating and positioning, designers can enforce their description of technology.

The designers enact design knowledge, and their designer subject positions, as knowing design through the gathering together, and synthesising of many different types of knowing. The enactment of knowing design has been made possible through the separation of the human and the technology. This separation effects designerly knowing to be enacted as the designer being a designer body that contains the synthesised design knowledge (see "5.1.2 Transforming design knowledge"). Moreover, the designer body is *needed* to mediate the design knowledge.

Professionals are, according to Knorr-Cetina (1999), the symbol of the "lifeworld" of materials they work with on a day to day basis. According to Knorr-Cetina's workplace investigations, professional skills can be described as a constellation of materials within which the body of the scientist/surgeon/designer is integrated, and even when not in the vicinity of the workplace constellation, the person stands in for this "lifeworld," as a representative or as a "symbol or carrier" (pp. 219-220). It is thus that one speaks of a scientist, surgeon, or designer. The designer is a carrier of the lifeworld of MacBooks, spreadsheets, iPhones, users, design patterns, guidelines, code prototypes and artistic bicycles. Within this lifeworld, of which the designer subject is a carrier, the designer body itself, as a particular body, is constituted by the intra-actions that Barad theorises. Following Barad's "things-in-phenomena" (Barad, 1998, p. 104), the designer may be conceptualised as the thing-in-phenomenon made up by the intra-actions of knowledges such as riding a bike acrobatically, visual look and feel, business values, competitor reviews, search logics and taxonomies, which come together in the designer body. It is a tentative conceptualisation of the

designer body as the "apparatus" (Barad, 1998) that bundles the relations of simultaneously splitting and synthesising of different entities.

When designers say, "I like this" or "I don't like that," the designers say this in their reality of the designer body incorporating design knowledge – as the apparatus that makes possible the synthesis and containment of this knowledge. The designer enacts the position of being a mediator of design knowledge, and therefore not as somebody who has a personal opinion, but as some*body* who knows in designerly ways, having synthesised many natures of knowing. In the enactment of design practice, the designer body is a medium. The designer's experience and utterance ("I don't like that"), does therefore not count as a subjective experience in the enactment, but as *designerly knowing*. Practitioners position themselves by learning to become "recognisable as a competent participant", through the positioning and being positioned within the sociomaterial networks that constitute them (Alkemeyer & Buschmann, 2017; Alkemeyer, Buschmann, & Michaeler, 2016). Designers position themselves as knowing subjects by speaking in ways that show the embodiment of design knowledge.

Designerly practice works to reproduce, both the synthesis and the separation of different types of knowing. The designer subject as capable of mediating different types of knowing is produced through the separation of the human and the technology. At the same time, designerly knowing is produced through a body that has the capacity to synthesise the different types of knowing. On the one hand, the designer body is produced through the separation and isolation of technology from all the rest. And on the other hand, the designer body is needed for the synthesis made through the separation. The designer as a subject is reproduced as a mediator of design knowledge.

Furthermore, I argue that these subject positions work to produce an exclusive zone around what it means to be a designer, through the simultaneous separating of the human and the technology on the one hand, and the mediating of the separate entities on the other hand.

It becomes possible for designers to embody design knowledge and not personal opinions or bias. If anybody else would say, "I don't like that" it would count as bias, and other actions would ensue, such as *breaking* the project. If the designer body says, "I don't like that," it counts as designerly knowing and design proceeds. It has become visible that a designer body is needed for designerly knowing. It is thus that design knowledge is not open to just any*body*, but only to the designer body.

Design ability is enacted as the synthesis and the transformation of many knowledges into a "superior" one, in the words of Roger Martin (quoted in Kolko, 2014, p. 22). It is the designer body, and not any*body*, capable of this way of knowing.

So, the simultaneous separating and synthesising of knowledge enables, on the one hand, the expert designerly knowing versus the personal opinions of what other people say, and on the other hand, the distance that allows the competition for a hierarchical position. Although, even though "rock stars, gurus and ninjas" are not acceptable anymore, as the Lean UX principles point out (Gothelf & Seiden, 2013, pp. 7-13)*, with the transformer abilities of the designer as they are practiced ("5.1.2 Transforming design knowledge"), along with empathy ("5.1.3 Empathy"), and the strong moral framework of wanting to do good in the world ("5.1.1 The calling to being a human-centred designer"), designers are putting themselves in an advantageous spot for becoming superheroes again. The possibility of the designer to be a hero per se does not exist anymore, but in the innovation games, the designers have the possibility to renegotiate their hierarchical position. The complicated negotiation around the position that designers take, makes it difficult even for designers to disclose their status (see "5.1.5 What do you do?"), but the negotiation game opens the competition for hierarchy that may be reshuffled in favour of the designers. It is thus that designers have the possibility to regain some of the former glory as design superheroes – in new clothes.

Both facts versus bias, and higher positions and lower positions, are the stakes in the innovation games as a reordering game. In the reality enacted by design practice, the designer has a better starting position than anybody else. For designers, speaking as a designer means to speak from a position of *knowing design*, and not from personal opinion. Furthermore, the designer position is enhanced by having a flexible location, where everyone is responsible for a different thing. Software developers are responsible for the technology; only design is responsible for everything and is thus the glue in between, mediating everything (see "4.4 Ordering practices").

When conceptualising the designer as an "apparatus" (Barad, 1998), a consequence that accomplishes the splitting and synthesising of design knowledge may be the tentative idea of the designer as a *technohuman*. The designer subject position, as well as the design object, are based on the separation of the human and the material; the human and the technology. Design ability is enacted as the re-uniting of the human and the technology, in which the separating is implicit.

Specifically, the designer body is able to *know* in designerly ways. To recall Barad's concept of agency:

> *"Agency is […] 'doing'/'being' in its intra-activity. Agency is the enactment of iterative changes to particular practices through the dynamics of intra-activity." (Barad, 2003, p. 827)*

Reading the designer body as an apparatus that comes to be in the intra-activity of the phenomenon of design, as a thing-in-phenomenon (Barad, 1998, p. 104), agency in design can thus be explained to be anchored in the designer body, exclusively. Barad's concept of agency has helped to shed some light on the reproduction of individual designerly agency. Designerly agency is enacted to absorb and make whole the parts *technology* and *human*, fuelled by the implicit separation of these categories. The realities of human-centred design practices produce a notion of the designer being a technohuman body. The tentative concept of the designer as a technohuman points to an interesting way forward to explore further the individualised designerly knowing embodied by the designer in human-centred design practice.

[I would like to make a side-note here. I use the term tentative here in connection with the designer body as a thing-in-phenomenon (Barad, 1998, p. 104), as I see this as an important emergent connection to mention, but I do not see it in the scope of the thesis to explore this idea further. I would like to continue working on this particular topic after the Ph.D. It seems an interesting area which captures the individualisation of design agency and design knowledge. Conceptualising the designer body as an individualised apparatus and could be used for explorations how this conceptualising may be reinvented for a more open and cooperative approach to design.]

To conclude this section: Design, the object, and the designer, the subject, are both needed in design practices if those practices are to survive and thrive. The designer and design are made for each other, and through each other, and they require each other. Design practices bring back design into the hands of the human individual.

5.2.2 USING DESIGN AS A TOOL

Mol (2002) speaks about an object having multiple realities. An object is always enacted locally as "ontology-in-practice" (p. 157). In the ontology-in-practice it is up to the participants to negotiate

design as the object of practice. Different practitioners in the innovation games may enact different objects of design, and these objects may clash, where "one of them will be privileged over the other" (Mol, 2002, p. 47). However, the ambiguity around design as an object keeps the innovation games going and keeps the outcomes open.

Design is a fluid object that lives, with the designers as fluid subjects, in the negotiation of practices. Each site negotiates its own reality. Different experiences of reality, as designers may have, do not make each of them less real, "but it does turn them into what will *count as the reality* in a particular site" (Mol, 2002, pp. 47-48, author's emphasis). So, there is a vivid negotiation going on over which version of an object will *count* in the reality of any individual local site. A site may be understood as clusters of relations producing sociomaterial knowing and practicing (Gherardi, 2012, p. 19). In the site of work, designers partake in the organisational practices, enacting their version of the design object. For the designers, their local site of the *human-centred design community* comes together with the other local site of the *organisation* where they work. As these sociomaterial relations of both sites interweave, designers seek to enact their version of reality within the organisational practices of design. The enacting of one's own version of an object is a partaking in the ontological politics of negotiating the realisation of an object (Mol, 1999). In the following section, I will draw attention to the ways designers, firstly, make a move to propose work relations be reordered, as the innovation games, and secondly, make another move by creating an active representation of *their* version of the design object.

Alice describes to me how the situation has changed in her organization. When she began working in her current company, it was very "technology-driven" and "really heavily based on engineers." Now, she explains, the designers and the engineers work together well.

> "Now, as you can see, [the designers] are many more and I think we're much more integrated, you know, being sat together with engineers and working together with them but when I first joined that wasn't the case". Then, there were hardly any designers; the engineers had hardly worked with designers before, and they are not familiar with caring about the user. When she arrived, she saw it as her responsibility as a designer to bring the "user-centred way" to the technically driven team and processes, and she describes to me the progress and success she

> had with that. "[They] gave me this huge project, I had to design from scratch, basically, one of our two biggest products, and I said, 'I need them to speak to the users. I need to do some proper research beforehand in order to collect my requirements and what needs to be done' and that [took quite a long time because of] the size of the product, but for a couple of engineers it took a bit too long, [they struggled to] understand the benefits and then once they did, then we built that trust and relationship together."

I ask Alice how this change was possible to happen. She explains how she built up the trust with the engineers – through being "transparent" with her work, and through giving "them an understanding of the process."

> "[I am] letting people trust my processes by seeing the results, so I was very transparent with my work. So, I did a few focus groups, more like workshops, I guess, with users, and then invited, in each one of them, one of the team members, so one of the developers, and for all of them it was the first time they'd actually been included in something like that and that already brought them a step closer to what I was doing and then when I did my research, I had interviews, […] collected all of my information and I started analysing my results, I created a presentation, essentially, and I invited all the stakeholders and I presented them with the results, so, again, that gave them an understanding of the process and why I was doing things […]."

Alice tells me about a design process diagram that she created and distributed when she started work at the company. She tells me about her success story with the company and shows me the design process diagram that had helped her intervene. Alice explains how the engineers' version of the design object was an *artistic* one, and how she managed to convey her own version of design, as a *problem-solving* methodology, to them. Alice is satisfied that now the engineers and the designers have established a good understanding of their collaboration.

> "Before, many developers here, especially in that team, were trying to solve problems that weren't really their job to solve but they didn't know that. They

> weren't aware that a UX designer could assist them with that. I think they thought that every person that has the word *Design* in their job title is the artistic type, you know, that they'd deal with colours and font sizes and that's about it, they won't deal with actual functionalities, but they needed to understand that, and once they did then they started communicating their problems with me and then the everyday work would flow more naturally, they wouldn't waste time trying to resolve problems that weren't their job to resolve, so that made things much quicker."

Within the diagram, Alice defined activities and job roles. She ordered the activities into groups, and she allocated job roles with each activity. She educated her team to understand her ways of working. She defines these roles for the team: product lead, user experience, technical lead, visual design, developer. She annotated with each activity with the types of team member who would be involved in that activity. The design process diagram in front of me shows the four stages: Discover, Define, Design and Develop. The stages are graphically aligned in a linear flow on the A4 page:

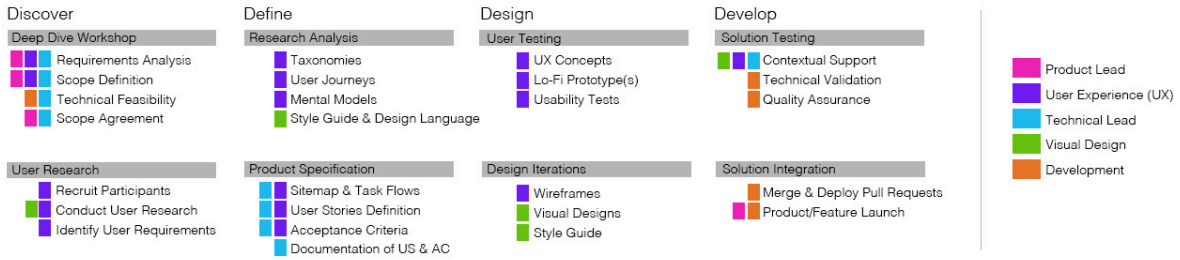

Figure 36: Design process diagram, created by Alice

In the ordering of the diagram, I observe five things:

1. Separate activities are defined and chronologically split into *defining* groups of activities (Discover, Define) and *implementing* groups of activities (Design, Develop). This representation draws backup from the similar, well-known double diamond (Discover/Define - Develop/Deliver). It also corresponds with the separating of activities into the stages *analyse* and *synthesise*, or *think* and *do*, and strengthens this version of the

design object, as the integration of two entities on the one hand, and their separation and hierarchy on the other hand.

2. The (human-centred) design professionals and the (technology-centred) engineers receive the same strength representation in the defining part of the process, and thus the activities that come before all other activities. Alice assigns UX and Technical lead about equal strength responsibilities during Discover and Define, while she asserts full responsibility to UX during the stages User research and Research analysis. The equal strength representation appears as a fair move and might seek to establish the trust that Alice spoke about in this mutual collaboration. At the same time, she asserts the UX responsibility for User research and Research analysis so the collaboration would "flow more naturally, [and] they wouldn't waste time trying to resolve problems that weren't their job to resolve." This is Alice's proposed shaping of the design object.
3. Design professions are split (UX designer versus Visual designer), as are engineers (Technical lead versus Developer). Alice explained that Visual designers (in contrast to UX designers) are designers who join the process later because they are only "working on effects and visual interactions, rather than user/product interactions." That Alice works with the *user* instead of with *colours and font sizes* has materialised in this design process map and was thus made real. Alice reinforced that she is a UX designer who considers the user, not an artistic designer, and not an engineer. This reinforcement was enacted through saying it, but also through drawing the small distinct rectangles in the design process diagram – User experience designer and Visual design, and assigning them distinct activities – Requirements analysis and Style guide respectively. Alice enacts the earlier established differentiation between UX designers and UI designers ("5.1.4 Doing UX").
4. UX designer and the Technical lead are placed in the *defining* part of the process, while the Visual designer and the Developers are located in the implementing part of the process, achieving an equal distribution of designers and engineers across the defining and the implementing activities. Compare to point 2, also the hierarchically *lower* parts of the two disciplines gain fair distribution during the *implementing* responsibilities. With the equal distribution in the *front*, she also created a precedent for the *back*.

5. The UX designer (Alice) is present in almost all activities of the design process. Specific locations are assigned to other roles and an all-encompassing presence to Alice.

Alice has delicately dissected production work into *technology*, *business*, and the *user*. She created the knowledge entity *dealing with the technology*, which she assigned to the Technical lead and the Developers, as well as to the Visual designers who work with the tangible aspect of the user interface. She created the *business* entity by giving small parts of the work, such as input in scope definition, requirements, and launch, to the Product lead. She created a large *user* entity by dedicating many work activities to user research and evaluation. These, she mainly assigned to herself, in concert with the understanding that the human-centred designer stands in for the user. In bringing these knowledge entities together within a design process diagram, they have been created at the same time.

In respect to point 5 of the analysis of Alice's design process diagram, I will expand now on the positioning of the UX designer as generally present everywhere. User experience is represented during almost all activities of the process (16 out of 26), and during almost all stages of the process (7 out of 8), this represents all apart from the Solution integration group of activities.

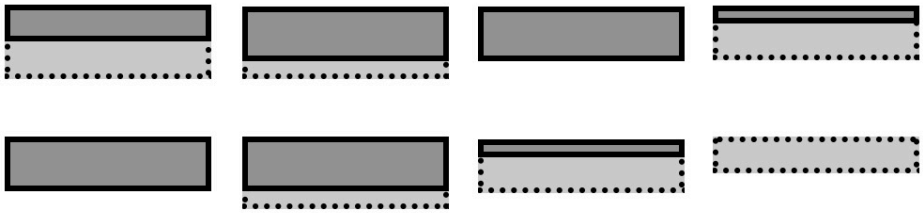

Figure 37: The solid outline is a schematic representation of UX design in the process

If all design roles are included, both UX design and Visual design, there are hardly any activities without design-representation. Design is involved in 19 out of 26 activities. Only 7 activities are non-design related.

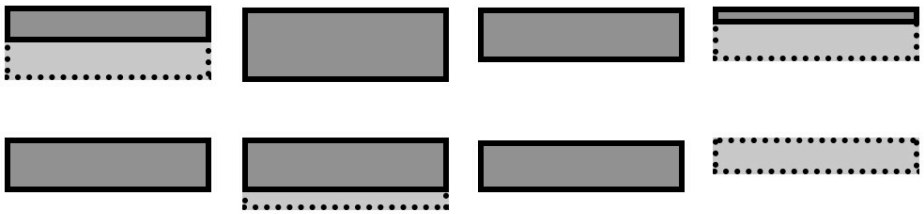

Figure 38: The solid outline is a schematic representation of all design in the process

In summary, Alice allocated locations to the user-related UX designer role (herself) throughout the design process, aiming for an even and constant distribution of user-centredness. In the design process diagram, Alice placed the senior engineers (Technical lead) alongside herself in the front tasks such as Scope definition or User stories definition, and so put both, designers and engineers, together in the driving seat. The Visual designers and Developers are placed in areas of limited scope, such as Style guide and Technical validation, respectively.

The fact that Alice can draw the diagram allows her to represent herself according to the design-practice representation of the designer as responsible for every type of activity, and as the mediator of those ("5.1.2 Transforming design knowledge"). Alice was able to draw the diagram because she is competent in knowing *drawing*. Alice tells me that when she showed the design process diagram to the team, she received compliments on the way how visually nice it looked, which made her frustrated because she had worked hard to distance herself to the *artistic type* of designer. Nevertheless, her graphic design abilities did enable Alice to not only draw the diagram, but also to make a move in the negotiations of the innovation games.

Alice has made a move to propose her version of orders and positions of knowledge entities to be taken up as the general version of reality. By *making transparent* her ideas of working together, she makes a proposal about the order and position of entities and their knowledges. Alice's diagram maps this order, and she puts it out there to propose the order. "Like (human) subjects, (natural) objects are framed as parts of events that occur and plays that are staged. If an object is real, this is because it is part of a practice. It is a reality enacted" (Mol, 2002, p. 44). With the diagram as a representation, Alice frames entities and makes with this framing an intervention in the

organisational practices. Her artefact of framing - the diagram with the shapes and the text, the email with which she sent it out to the team, the paper on which she printed it to show me, and the people who view it and consider it - is an artefact which participates in this intervention as part of the negotiations of organizational practices to compete around the enacted reality of design. Alice's design process diagram is – much rather than a passive representation of any naturally ideal way of working – a live artefact, a tool, an object, with which Alice intervenes in the orders and hierarchies of people, things and their knowledges within the innovation games.

5.3 ACTING WITH DESIGN

Alice made an intervention within the innovation games through the help of design as an object. The diagram itself became an active participant with Alice, in intervening in the organisational practice. At the beginning of the analysis, I investigated how books, training events and conferences postulate certain images of design. They institutionalise design practice within digital innovation; they prescribe design activity; they help designers by providing guidance. These books, training events and conferences, with their artefacts, websites, words and images are representations of design, which help shape human-centred design as a practice.

But these representations can also be used to intervene in other practices. In Alice's organisation, the diagram helped her to propose new orders and positions of knowledge entities within the technology-driven organisation. Jack and Gerald use a presentation about the Sprint methodology to take action within their organisational processes and seek through it to insert *their* orders into these processes. Noah took his boss to a conference and made him understand that he, Noah, needs to be more involved in organisational process and that Noah can integrate other processes more effectively. All these examples are designers making interventions in the organisational orders and positions. It is a move within the innovation games, an intervention on behalf of the designers in order to reorder and reposition people, things and their knowledges according to the idea of human-centred design. It is a representation of the realities of design practice to count as the generally accepted reality. Design is a tool with which designers can act.

What is less obvious, but nevertheless present also in these interventions, is that the ordering activity itself – if successful – inadvertently also moves the position of the designer. On the one hand, the new ordering benefits the designer as it positions the designer centrally in the mediation of all

knowledge entities. On the other hand, it is a particular enactment of conceptualising design agency – the capacity to act. The designer, with the *design* tool in hand, may be an effective designer after all. Design ability is not an attribute; it is a "'doing'/'being'" (Barad, 2003, p. 827). Design ability is enacted in design practice. Both the identity of the designer and the capacity of design, which are completely entangled, are enacted and negotiated in design practice. Design ability and its effectiveness – I will call this *agency* – negotiate the *effect* of the *designer*. Design as a tool may enable the designers to reclaim and redefine agency in ways that promise to work for the *designers*.

I have not investigated the effect of design practices on organisational practices. I can, therefore, not make a claim about the effectiveness of designers. Nevertheless, I have been able to speak about the realities as enacted in design practices and how designers seek to negotiate the realisation of their practices within organisations. Design as a tool allows designers the move to intervene in organisational practices, and this is what they do. How it benefits them, and whether they are able to take up these subject positions, was not part of this research.

What becomes visible in this chapter is how the identity of the designer as a subject – the knowing, being and acting as a designer – is entangled in the enactment of the design as an object, and in the designer's position as a subject. It is therefore also the position of the designer as a subject that is at stake in this negotiation, and which is sought to exist and live. The initiative and the competence to draw design process diagrams, make presentations about design methodologies, and take a boss to a conference are moves that not only to reinforce the realities of design but also the negotiation around the identity of the designer. Not only the order of production is negotiated, but also the position of the designer. In design practice, the designer is enacted as the authority of ordering action. The enactment thus seeks not only to intervene in the order but also in the designer's position of authority of doing the ordering. With the design process diagram, as Alice made it, with a company-presentation of how the design team may help the organization innovate as Jack and Gerald did, and with communicating design's ability to be a hub for organizational processes as Noah did, the designers propose to their organisations who they are and what they can do. These activities are as much an enactment of design as an object, as they are an enactment of their professional identities. Although the designer is in design practices enacted as the authority of ordering activities, within the wider organisational production processes this position is still to be negotiated.

6 THE MAKING OF DESIGN

In this chapter, I will revisit each analytical chapter ("3 Design as a human-centred methodology", "4 Design as ordering", "5 Knowing, being and acting as a designer"), and I will bring together the findings of these chapters. Although I have discussed design as an object, the action, and the designers as subjects, in different analytical chapters in this thesis, these entities are not separate but co-emerge in practice (Gherardi, 2012). Focusing on each of them separately was a systematising of my view of human-centred design. I started by separating the three areas as modes of viewing the phenomenon in practice. Now, I will bring them together again. They were never supposed to be separated, but I needed to tell a story, and I needed to do it convincingly. I needed to open the research I have conducted. I needed to take the reader with me through this research. These three strands – object, action and subject – were the way I opened it up. In the final analytical chapter, I will bring these strands together and synthesise what was said before to represent my findings and then make the argument of my thesis.

With this thesis, I have contributed to understanding design. A design cannot be understood without understanding the experiences of its making (Yaneva, 2009). And the same is true for design itself. Design needs to be understood within its conditions of making, which are played out in the sociomaterial relations in which representations and action co-emerge and constitute each other.

6.1 DESIGN AS A BLACK BOX

In the Chapter "3 Design as a human-centred methodology" I illustrate how the designers make a case for the need of design in digital innovation: According to designers, innovation is not progressing the world in a human-centred way. Designers want to make innovation processes and their technologies more *human*. In this endeavour not only are the entities of the *human* and *technology* seen as in need of reuniting, but also their hierarchies to be reconciled in a human-centred way. In this reconciliation the *human* reclaims an importance and a centrality. Design is represented as the tool, the object, which can make this reconciliation happen (see "3.1 Making the case for design"). As a methodology, a framework to order knowledge entities, design seeks to correct the side-lining of the *human* and to reclaim a focus on the *human* in a proposition to order production

in a human-centred way. Designers speak about the centring of *users* within production, in order to serve the needs and improvement of society.

Designers problematize the existence of separate natures of knowledge, and, to use the words of Callon (1986), make themselves "indispensable" as "obligatory passage points" (p. 6-7) by way of suggesting design synthesis as the solution. In the descriptions of design's capacity of synthesis, there is an emphasis on the different disciplines, such as designers, developers, and product managers, who need to work together. In Callon's words again, designers "lock into place" other actors within the "programme" of design (p. 8). In the designerly descriptions of roles and locations, the different actors harbour naturally different ways of knowing, such as intuitive knowing and logical knowing, financial knowing, and technical knowing. By suggesting that it can bring all these separate parts together in synthesis for a better way of innovating, design locks these separate roles into place. Designers remain without location lock, by referring to their designerly ability of being able to conduct the mediation.

This proposed designerly mediation is formalised in the design process (Brown, 2009; Cross, 2011; Dorst, 2011; Martin, 2009; Verganti, 2009). There are many different design processes, and they continue to be developed (Bobbe et al., 2016; Gericke & Blessing, 2012; Howard et al., 2008; Mueller & Thoring, 2012; Wynn & Clarkson, 2005, 2018). I propose that the various efforts in striving for the right design processes have in common the idea that separate parts need to be made whole, reconciled, and reordered in a course of action that puts the human first. The design process is represented to be a human-centred methodology for reconciling partial things in a process in order to make them whole.

Human-centred design is represented as being able to mediate different roles and different types of knowing, and so helping to overcome the technological domination of innovation. However, the designers experience in practice the inadequate capabilities of the design process to execute this plan: Firstly, users are difficult to reach, they have to be of a distinct kind, in order to be *centreable* - eg, they need to speak English, live nearby, have a good credit history, be not too important, nor too junior (see "3.2 The designers at work"). Secondly, within the organisational practices, designers feel at the mercy of developer schedules and tastes, and of manager whims and business priorities. The representation of human-centred design does not fit with what designers are experiencing in practice.

Design appears to be a black box that works in ways not quite understood. The representation of design is an unclear concept with apparently hidden functionality.

The hidden functionality and often inadequacy of the human-centred design processes, as the designers are experiencing in practice, however, inspire designers to try and improve their methods and processes. They get involved in training events, conferences, and they read books and even write books. Many books are written by practitioners who experienced frustration in their work practice. Books are, therefore, a key driver in the reproduction of the idea of design as a device for the innovative ordering of technology production. The representations of this idea – the books, the conferences – also help designers who feel stuck to achieve an improvement. Noah, for example, achieves an improvement of what he is understood to be able to do within the organisation, by taking his boss to a conference that talked about the responsibilities, capabilities and the value of design in digital innovation. These are hints that design has a special function for designers, which effects the maintaining of human-centred design practice. In order to open the black box, I have turned around the epistemological lens called *human-centred methodology*, in order to look at the lens itself, and its production, so I may find out more about the function of design.

In the following, I will summarise and draw together how the analysis throughout the last few chapters has progressively revealed different aspects of design practices and has, through this, opened the black box of design and shone some light on the sociomaterial relationships making it up.

6.2 ORDERS IN PRACTICE

In the chapter "4 Design as ordering," I reviewed design practices as the enactment of design, in which designers seek to establish certain orders and positions of people, things and their knowledges, and thus enforce their version of reality within the production practices of organisations. As I will argue, both the orders, as well as the designers' positions, are negotiated through a separating of the human and the material.

In the unfolding activities of design practices, methods of ordering, such as games, rules, principles, sketching exercises and voting, are used. Design is proposing the *innovation games* for organisational production, as a way of renegotiating orders and existing boundaries between production and use, between individual and collective, and between the various interests and disciplines. Design proposes

the innovation games as a reconciling between what *technologists* want versus what *users* want. However, through these representations, the different knowledge entities, as individual natures of people, things and their knowledges, are reinforced (use, production, the user, the designer, the engineer, the technology, the manager), instead of reconciled.

I reviewed how *users* are concepts who are made to fit the organisational processes. This was argued by several others before (Oygür, 2017; Vines, Clarke, Wright, McCarthy, & Olivier, 2013; Wilkie, 2010; Woolgar, 1991). This raises the question of whether people can actually be centred in the design processes. The *user* is present only through the fitting work of the designer. It is, therefore, not the people outside of the organisation who are present, but the fitting work of the designer. Rather than making the user present in production processes, the user thus *fitted* helps designers to make credible cases and provides leverage for designers. As a designer, being able to make a case with the help of the user enables some ideas to be developed and others to be dropped. Using the banner of centring the human is powerful, but this is an implicit power that is not openly discussed. Accountability for design decisions is shifted onto the *user*, without making explicit that the *user* was *fitted* and is thus a construct made up by the various organisational practices and its participants. Wilkie discovered this:

> *"Users are held accountable by way of the methods used to construct them, but once constructed, those representations become the means by which designers account for decisions about technologies, and account for their own continuing value to their employers and to expert HCI communities." (Wilkie, 2010, p. 203)*

The remaining-implicit of the user constructs user-related design knowledge as existing naturally, and as the only way that the user information could have come to bear within the design process. The user also becomes a potential hiding place for the designer. Representing the user becomes a convenient location to inhabit, as it can be fitted as required. The flexible presence in the design process effects that designers may remain anonymous. It is a problem that Suchman (2002b) calls out when she talks of the implicit locations of designers in their work:

> *"Within prevailing discourses, anonymous and unlocatable designers, with a license afforded by their professional training, problematize the world in such a way as to*

> *make themselves indispensable to it and then discuss their obligation to intervene, in order to deliver technological solutions to equally decontextualized and consequently unlocatable 'users'." (p. 140)*

Suchman draws on Haraway when making this statement, who came up with the term the "god-trick" that describes the implicit power of "ways of being nowhere while claiming to see comprehensively" (Haraway, 1988, p. 584, also quoted by Suchman 2002).

The user becomes a useful knowledge entity to stand-in for. Nevertheless, this *centring* of the user reproduces the gap between production and use, as the actual user couldn't ever take up a space within production that is already inhabited by the designer standing in. In the separation between production and use, the user is effectively excluded, and cannot possibly be included, as the absence is *covered* by the designer in the negotiations of the production practices. The user's absence is obscured.

Similarly, in team collaboration the separate *natural* knowledge entities of a group of persons are *mediated* by the designer, but implicit remains the designer's work of selecting ideas, consolidating votes, leading on drawing and prototyping activities, and rearranging the team collaboration outcomes. Mediating and facilitating groups becomes a convenient place of being able to use knowledge flexibly.

Facilitating teams and standing in for the user become sites of using knowledge flexibly, on the one hand. On the other hand, these practices become a shelter from visibility; a remaining undercover; an operating in the dark. It becomes a convenient place of being out of reach for any queries of accountability.

Yet more important, these design practices are the sites where the separate knowledge entities are made and maintained. The representing of these knowledge entities as natural, and the remaining-implicit of the designer work in making them fit within the production work, provisions the making of them. Designers capture and contain user knowledge as a knowledge entity which they are able to use when and where they see fit. In team collaboration designers mediate the work of selecting ideas, consolidating votes, and rearranging the group's ideas. The remaining-implicit of this fitting work is

constructing these knowledge entities as existing naturally, and as the only one way how the knowledges could have come to bear within the production work.

In the unfolding negotiations within the production practices, opened up as the innovation games, designers and software developers make competing descriptions of the UI. The practices of describing the UI are the means by which a separation between design and implementation is enacted and by its extension, a separation between the human and the technology.

Through the locating of separate *natural* knowledges entities, *technology* can be isolated and assigned to the engineers while the designers remain in the convenient location of mediating all knowledge entities, technology contained within them. Through this containment and isolation, a hierarchy is effected in which the designers' description of the UI is expected to be defining. The hierarchy is produced through the limiting association of the engineers with *technology*, and the all-encompassing association of the designers with mediating all knowledge entities, including *technology*. Furthermore, the ways implementation is isolated in design practices create a distancing and an opposition between design and technology, in which design is on the side of the human, not least through the standing-in for the user.

Human-centred design practices enact a separation between technology and the human. Design practices actively reinforce the separation of entities that they claim to be able to synthesise. While representing design as capable of mediating human interests with technological advances in innovation, design reinforces the separation of the human and the technology. Human-centred design practices simultaneously split and synthesise entities. The simultaneity has been made visible in the story of Alice, who in drawing the design process diagram enacted both the division and the synthesis of the knowledge entities such as *technology*, the *user*, and the *business*. This representing work of design has simultaneously separated and synthesised knowledges within the production.

The enactment of the splitting and synthesizing effects a flexible location and strong negotiation position for the designer as a mediator of knowledge entities, and as a stand in for the human interest. Design is a device to reshuffle orders and positions of people, things and their knowledges, in which new and advantageous positions can be achieved by its user. This use and function of design are currently obscured. Current design practices serve to obscure designers' locations, which potentially hides accountabilities of design action. Designerly interventions are "profoundly

political" (Mazé, 2016, p. 41), and therefore conceptualisations of design need to take into account the designers' locations.

6.3 ABILITIES IN PRACTICE

Although designers cannot be made solely responsible for design action, they are also not neutral mediators of natural knowledge. The designers enact singular identities and subject positions in practice, through which they come to *be* and *know*. Designers participate in design practice, and they participate in the enactment of design as the simultaneous splitting and synthesising of the human and the technology. And when their tool, design, works, they find themselves in flexible locations and advantageous negotiation positions.

In light of this, it is useful to look anew at design ability, because this conceptualisation will describe how design ability currently remains firmly with the designer. Design ability, that is, the ability to *know* and *use* design, may be conceptualised as constituted within the simultaneous splitting and synthesising of the human and the technology. While this agency may be understood as distributed in sociomaterial practice, it is nevertheless enacted within the individuality of the designer subject. Designerly knowing is practiced as a special form of knowing. Through the separation of knowing and doing, and human and technology, the designer body is conceptualised as capable of taking in, holding, and transforming knowledge, in ways that no other body is able to do. This capability is described as "superior" (Martin quoted in Kolko, 2014, p. 22) and "truly interdisciplinary" (Brown, 2009, p. 27), and is epitomised in IDEO's and Stanford d.school's representations of acrobatic bodies cycling and climbing studio infrastructures. The designer body is understood as a medium capable of special *understanding capacities*, such as empathy (Young, 2015)*, as *empaths*, as Olivia said, and incorporating a scale that spans intuitive and logical thinking, as Miriam said. The designer enacts this *being* in speaking about designs, not as a person speaking with personal opinions, but speaking as a body that knows design through containing and having mediated all knowledge. Furthermore, designerly knowing is enacted as an exclusive position. The separation between the human and technology work to produce a hierarchy within which high hierarchical positions are possible, including within the design profession itself. Design ability is described as a "multi-faceted cognitive skill" that integrates different types of knowledge into a distinct form of designerly intelligence (Cross, 1990, p. 134), belonging to the "highest cognitive abilities of human beings,

including creativity, synthesis and problem solving" (Cross et al., 1996, p. 1). And so the designer is not claiming a high status as a *person*, but as a *mediating body* with extraordinary capabilities.

Within the "lifeworld" of the professional (Knorr-Cetina, 1999, pp. 219-220), the designer is constituted as the particular body of designerly knowing. The designer as a subject is constituted through the object of human-centred design. Using Barad's concept of "apparatuses" resulting from the "intra-actions" of lifeworlds and "mattering" as "things-in-phenomena" (1998, p. 104), the designer body is bounded as the human capable of designerly knowing. It is to that I tentatively sketch the idea of the designer as a technohuman – a body simultaneously splitting and synthesising the human and the technology. The technohuman as individualised design ability may be an interesting concept for intervention by reinventing it as a more cooperative device going forward from this thesis.

Just as the object of practice is enacted in practice, and negotiated within the ambiguity of the innovation games, is the designer as the subject of practice enacted in practice. And although the designer's *location* is kept ambiguous amid the flexible mediator capacity of the designer body, the *position* of the designer is distinct and exclusive. The position of the designer is defined through the special capacity of designerly transformation of knowledge. And it is this specific subject position that is at stake also in the innovation games. Designers seek to assert their positions as the experts on design. Vines et al. (2013) have warned the designer community of "issues about control and agency" (p. 435), highlighting designers' difficulty in sharing control over the design process. But the innovation games show how the designer's identity is entangled with the use of design and with the negotiations around its effectiveness. If the negotiations of the designers' version of design are not going well, it must be terrifying for their very existence. What would it say about them, as designers, if their version of the design object – the ordering action in human-centred ways – was rejected, and lost against the domination of technology, or against the whims of business managers? In the negotiations of design practice, the very identities of the designers are at stake, along with their exclusive position. The negotiation of design as an object and the negotiation of the designers as subjects are entangled. The risks of losing the negotiation might be a powerful driver for the continuous innovation of design, through conferences, books and training events. It is not a notably special insight that designer identities are entangled with design practice and with the negotiation of

the design as an object. However, because the design object is represented as a collaborative process, the position of the designer may be in question as up for collective replacement. This question hanging in the air may reinforce the designers' assertion that their ability is special and that their position is not up for replacement. This risk of expulsion from the exclusive zone may also provide a fruitful ground for exaggerating the conflict between society and technology, accelerating the separation of the human and the technology, and increasing the need for designerly synthesis. Although design activity is opened as a collaborative process, and although design is said to overcome the individual-collective divide through *truly interdisciplinary* skills, being a designer is still an exclusive profession. It is difficult to access, and for the designers, the occupation of this position is crucial for their existence. It is not possible to let designers off the hook completely here, despite the designer position being produced by design practice. Recalling Suchman (2007) with her reminder that sociomaterial relations need to be conceptualised whilst the tradition and "durable dissymmetry among human and nonhuman actors" is honoured (p. 270), it is important to point out the political involvement of the designer as an actor in making up design. The designer's subject position as a body with special designerly ways of synthesising entities, such as the *human* and the *technology*, obscures any visibility on the making up of these entities in innovation practices and thus obstructs any problematizing of this boundary-making. It is the designers who *do* this obstructing.

6.4 DESIGN AS A THING

It is as Simon (1996) said. Design practice is the active engagement with how designers think things ought to be. The designers come up with representations of how things should be. What is implicit is that design itself is one of these objects that are produced. Designers make representations of design as a device capable of ordering types of knowing into human-centred outcomes. They do this in books, at conferences, within their organisations, in process diagrams, in conversation, and in other places. In design practice, these representations help to enact the object of practice. The representations are part of the innovation games, which designers propose as a better way of organising production processes, but which nevertheless serve designers to negotiate the enforcement of their realities. Making representations of how something ought to be does not mean these representations will become real. Reality is negotiated in collective ways between designers and

organisations, amid the material networks within which they exist, including the artefacts that represent design, such as books, conferences and diagrams.

The challenge was how to investigate human-centred design practices in a way that would let this thesis go beyond the representations of design, permitting a view onto the practices of making up design. There are positions in human-centred design which are sensitive to the participatory and collaborative aspects of design practice, and there are accounts in HCI which seek to explore the materiality of action and experience. Wright et al. (2006) draw attention to the possibilities of understanding user experience as co-productive of action and change instead of seeing it as a personal state which needs to be controlled and enabled by the designer (pp. 6-7). However, in this present research it was necessary to go even further in exploring the designers' own participation in the material configurations of design work. There are existing explorations of the design studio which conceptualise the designers' worlds as collaborations between humans and materials constitutive of design action (Telier et al., 2011; Wilkie & Michael, 2015; Yaneva, 2009). Users become obvious as handy construction materials in design (Wilkie, 2010). Prototypes are made visible as "constituents" in the designer experiencing and getting to know their own designs (Telier et al., 2011, p. 71). These accounts do begin to question the cuts that are made in design practice, such as the separation between the designer and the user, and between the human and the material. However, these accounts do not go far enough in problematising the political position of the designer within their practices, effecting hierarchies and the negotiation of realities which involve other practices, such as organisational practices or use practices. They do not inquire further what designers achieve by separating body and mind, or by representing user needs within production processes, or by claiming the positions as human advocates attempting to trump those who deal with technologies. Bringing in this missing view on material politics, Suchman's writing is the critical voice which is the orientation for this thesis on how to inquire design practice. Suchman (2002b) has called out the "unlocatable" position of designers in design practice (p. 140). She wrote about collaborating with designers, being expected to deliver to them knowledge about the user, and she has given an experience account of the effect such understanding of design had on her, making her feel inadequate (p. 141). Suchman's account gives access to both, the politics of practice, and a critical view on design. It supports this thesis in intersecting views on design practices with the views on the material politics through STS. This intersection of materiality, politics, and practice, in

combination with Gherardi's concept of the three levels of readings (Gherardi, 2010, 2012), enabled a systematic reading of human-centred design practices.

Design action does not unfold according to the representations of design. This is the gap that designers experience in practice – between the representations of design, and the unfolding design activity. My research question was, *How do design as an object and design practices interrelate? And how do designers engage in it?* I have investigated the conditions of making up design as an object, by drawing on Gherardi, and in further detail also on Suchman, Haraway, and others in order to illustrate the sociomaterial relations-in-action. I have illuminated the subtle negotiations that take place within practices, in which the objects and subjects of human-centred design come to be. Designers experience in practice a gap between representations and enactments of design. This gap is created by the design representations claiming to be a depiction of the epistemic nature and capability of design. This claim obscures how humans (including the designers) are entangled with materials, including the artefacts representing design. The conditions of the making up of design as an object are invisible in this claim. The representation obscures the locating and making up of the entities by making them appear to exist naturally. Also obscured is the location of the designer, through the representation of design ability as the synthesis of entities. The obscured sociomaterial entanglements in practice, together with the representation of the design object and its capability, create the gap that designers experience.

An effect of the design object is that it obscures the making up of separate entities, such as *business value*, *technological feasibility*, and *human needs*, or *logic* and *intuition*. Design supports the impression that these entities exist naturally. Designers obscure the making of boundaries, and the politics involved, by taking up the position of the synthesiser. Through design and its function, the making of boundaries is covered up and does not need to be questioned. Design enables boundary making by filling the gaps in between, doing the gluing and the mediating. Through its seamless, simultaneous boundary making and synthesising, the making of boundaries works and is enabled, as natural.

The contribution of this research is the opening up of the black box of human-centred design. Design practice may be better understood as the simultaneous splitting and synthesizing of the human and the technology for the purpose of reshuffling orders and hierarchical positions of people,

things and their knowledges within organizational practices. Design practice effects the obscuring of boundary making by representing these boundaries of knowledge entities as natural, and by filling the gaps in between the boundaries. This contribution aims to enrich and broaden design research, as an exploration of design practices through a sociomaterial lens, and hereby creating a new way of understanding design.

In a final note on the reasons why this contribution to viewing design is relevant, I would like to point to the possibilities of conceptualising the agencies of design which result from this work. The designer is engaged in and through participation in the sociomaterial negotiations of human-centred design practices and other production and organizational practices. Design ability is enacted through the design object and its representation. The designer's capacity to design is enacted in the position of individual splitting and synthesizing of the human and the technology – in what might be termed a technohuman body. This subject position, as it is produced in human-centred design, needs to be negotiated with other production practices, in order to come to bear in the organisation. The negotiation takes place amid the designers' interventions in putting forward representations of design within organisational practices and proposing the innovation games. Representations of action are not neutral depictions of action (Suchman, 2007). Representations of action, such as plans, are made in order to hold situated action accountable (p. 74), and only when people are asked to explain why they did something will they use the plan to account for what they did (p. 67). In design practice, representations of design – design process models, books, words, imagery – are used as a way to make knowledge entities visible and accountable. However, instead of utilising representations of design for accounting for the locations of some and not others (the designer), and even accounting for some who are not even present (the users), representations of design could be used for locating and accounting for all who are present, and for making visible also who is absent.

In design, it is understood that outcomes and processes are interlinked. Representations and situated action reconfigure each other. The designer role has expanded to helping organisations innovate and create change. The particular *designerly ways of thinking/knowing*, on which I reported in my personal experience in the introduction, promises organisations and teams that it can be their methodology for innovation. Designers work very hard to fulfil this promise, but they are experiencing that the current representations of design do not support them in doing that. This is a difficult challenge which causes

frustration, but it is also an opportunity which designers can take head-on. Understanding the relationship between representation and action as co-emergent opens up the possibility of working with this ongoing reconfiguration of orders and positions. Ordering work is done in the ongoing relations in action. The access to this ordering work is there. It is only veiled through current representations of design. The reconfiguration work can be accessed by seeing the sociomaterial relations that make things up.

As a design practitioner, I understand representations and objects in design differently now. In understanding design as a thing which helps negotiate realities, design has turned into a helpful device. What was formerly a black box, is now a visualisation of relationships between all the things that I know so well, in a very different light. Sociomaterial practices have made visible the relations, positions and hierarchies which are constantly created and negotiated in design work. As a practitioner, it is a relief to know that the ordering work is happening, even without me, the designer, being in control. It is good to let go of the idea that design process representations prescribe design action. With this research, my contribution to design is the visualisation of the ordering relations between people and things in design practices, creating ongoing change. Now that I can see how agency and change unfold, I can imagine the ways in which I may want to participate in the design process. It is an inspiring revelation that design representations can be used as practical objects through which it is possible to participate in designing the future.

Going forward from here, I want to take on the challenge of visualising the ongoing reconfiguration work in design practice in ways that allow practitioners to participate in designerly intervention meaningfully. Through a sociomaterial practice lens I have made the flows of designerly agency visible. Within design practices, these flows effect constantly emerging orders and positions. In their visualisation they can become accessible as a framework for participation in design. The participation in designerly agency requires new representations of design processes which do not claim that they are neutral descriptions of design action. Quite the opposite, these representations need to propose that they are political objects for evoking change. Designerly agency – the ability to intervene in sociomaterial phenomena – will so become accessible. This design object provides access to participate in designerly intervention, both to designers and users of design. The representation does not only reconcile the trouble that practitioners experience in the gap between representation and action of

design, but it might also begin to resolve the gap between design and use, making visible the relations that exist between those meant to effect through design and those meant to be affected by design. This object is revealing them all as participants in the practices of design, and therefore positions them to be able to participate in the agency of design.

* In-text references marked with an asterisk denote this literature as part of the designer library (see the table in "2.5.6 Designer-led literature", p. 61-62).

7 REFERENCES

Akrich, M. (1994). The De-Scription of Technical Objects. In W. Bijker & J. Law (Eds.), *Shaping Technology / Building Society* (pp. 205–224). London: The MIT Press.

Akrich, M. (1996). User Representations: Practices, Methods and Sociology. In A. Rip, T. J. Misa, & J. Schot (Eds.), *Managing Technology in Society* (pp. 167–184). Pinter Publishers: London.

Akrich, M., Callon, M., & Latour, B. (2002). The Key to Success in Innovation Part I: The Art of Interessement. *International Journal of Innovation Management, 6*(2), 187–206.

Alkemeyer, T. (2013). Subjektivierung in sozialen Praktiken. In T. Alkemeyer, G. Budde, & D. Freist (Eds.), *Selbst-Bildungen* (pp. 33–68). Bielefeld: transcript Verlag.

Alkemeyer, T., & Buschmann, N. (2017). Learning in and across practices: Enablement as subjectivation. In A. Hui, T. Schatzki, & E. Shove (Eds.), *The Nexus of Practices: Connections, constellations, practitioners* (pp. 8–23). New York: Routledge.

Alkemeyer, T., Buschmann, N., & Michaeler, M. (2016). Arguments for a subjectivation theoretical expansion on practice theory. In M. Jonas & B. Littig (Eds.), *Praxeological Political Analysis* (pp. 67–83). New York: Routledge.

Allen, J., & Chudley, J. (2012). *Smashing UX Design: Foundations for designing online user experiences*. Hoboken, New Jersey: John Wiley & Sons.

Anderson, S. P. (2011). *Seductive Interaction Design: Creating Playful, Fun, and Effective User Experiences*. Berkeley, California: New Riders.

Barad, K. (1998). Getting Real: Technoscientific Practice and the Materialization of Reality. *differences: A Journal of Feminist Cultural Studies, 10*(2), 87–126.

Barad, K. (2003). Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. *Journal of Women in Culture and Society, 28*(3), 801–831.

Battarbee, K., & Koskinen, I. (2005). Co-experience: user experience as interaction. *CoDesign, 1*(1), 5–18.

Baudrillard, J. (1998). *The Consumer Society: Myths and Structures*. London: SAGE Publications.

Beck, J., & Stolterman, E. (2016). Examining Practical, Everyday Theory Use in Design Research. *she ji The Journal of Design, Economics, and Innovation, 2*(2), 125–140.

Beck, K., Beedle, M., A., V. B., Cockburn, A., Cunningham, W., Fowler, M., . . . Kern, J. (2001). Manifesto for agile software development. Accessed March 3rd, 2017. Retrieved from http://www.agilemanifesto.org/

Bijker, W., & Law, J. (Eds.). (1992). *Shaping Technology / Building Society*. Cambridge, Massachusetts: The MIT Press.

Blank, S. (2013). Why the Lean Startup Changes Everything. *Harvard Business Review, 91*(5), 63-72.

Bobbe, T., Krzywinski, J., & Woelfel, C. (2016). *A Comparison of Design Process Models From Academic Theory and Professional Practice.* In *Proceedings of the International Design Conference*.

Bohemia, E. (2002). Designer as Integrator: Reality or Rhetoric? *The Design Journal, 5*(2), 23–34.

Bohemia, E., & Harman, K. (2008). Globalization and Product Design Education: The Global Studio. *Design Management Journal, 3*(2), 53–68.

Boland, R. J., Collopy, F., Lyytinen, K., & Yoo, Y. (2008). Managing as Designing: Lessons for organisation leaders from the design practice of Frank O. Gehry. *Design Issues, 24*(1), 10–25.

Bonsiepe, G. (1994). *Interface: An Approach to Design*. Maastricht, The Netherlands: Jan van Eyck Akademie.

Botero, A. (2013). *Expanding design space(s): Design in communal endeavours.* (Ph.D.), Aalto University, Helsinki.

Botero, A., Kommonen, K.-H., & Marttila, S. (2010). *Expanding Design Space: Design-In-Use Activities and Strategies*. Paper presented at the DRS 2010 Conference: Design and Complexity, Montreal, CA.

Bourdieu, P. (1979). *Distinction: A social critique of the judgement of taste*. London: Routledge.

Bourdieu, P. (1990). *The Logic of Practice*. Cambridge: Polity Press.

Bowker, G. C., & Star, S. L. (1999). *Sorting Things Out: Classification and Its Consequences*. London: The MIT Press.

Brown, T. (2008). Design Thinking. *Harvard Business Review, 86*(6), 84.

Brown, T. (2009). *Change by design: how design thinking transforms organizations and inspires innovation*. New York: HarperCollins Publishers.

Bryman, A. (2012). *Social research methods* (4th ed.). Oxford: Oxford University Press.

Buchanan, R. (2015). Worlds in the Making: Design, Management, and the Reform of Organizational Culture. *she ji The Journal of Design, Economics, and Innovation, 1*(1), 5–21.

Buley, L. (2013). *The User Experience Team of One: A Research and Design Survival Guide*. New York: Rosenfeld Media.

Button, G. (2000). The ethnographic tradition and design. *Design Studies, 21*(4), 319–332.

Buxton, W. (2007). *Sketching user experiences: getting the design right and the right design*. San Francisco: Morgan Kaufmann.

Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, action and belief: a new sociology of knowledge?* (pp. 196–223). London: Routledge.

Carroll, J. M. (1997). Human-Computer Interaction: Psychology as a Science of Design. *Annual Review of Psychology, 48*(1), 61–83.

Carroll, J. M. (2003). Introduction: Toward a Multidisciplinary Science of Human-Computer Interaction. In J. M. Carroll (Ed.), *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science*. San Francisco, CA: Morgan Kaufmann Publishers.

Chung, S. (2017). The Relationship Between Service Design and UX Design - Part 1. Accessed June 6, 2019. Retrieved from https://clearleft.com/posts/the-relationship-between-service-design-and-ux-design-part-1

Clearleft Ltd. (2018). UX London 2019. Accessed Dec 14, 2018. Retrieved from https://2019.uxlondon.com/

Cooper, A. (2004). *The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity*. Indianapolis, IN: Sams.

Cooper, A., Reimann, R., & Cronin, D. (2007). *About Face 3: The Essentials of Interaction Design*. Indeanapolis, IN: Wiley Publishing.

Coyne, R., & Snodgrass, A. (1991). Is designing mysterious? Challening the dual knowledge thesis. *Design Studies, 12*(3), 124–131.

Coyne, R., Snodgrass, A., & Martin, D. (1994). Metaphors in the Design Studio. *Journal of Architectural Education, 48*(2), 113–125.

Cramer-Petersen, C. L., Christensen, B. T., & Ahmed-Kristensen, S. (2019). Empirically analysing design reasoning patterns: Abductive-deductive reasoning patterns dominate design idea generation. *Design Studies, 60*, 39–70.

Cross, N. (1982). Designerly ways of knowing. *Design Studies, 3*(4), 221–227.

Cross, N. (1990). The nature and nurture of design ability. *Design Studies, 11*(2), 127–140.

Cross, N. (2001). Designerly Ways of Knowing: Design Discipline Versus Design Science. *Design Issues, 17*(3), 49–55.

Cross, N. (2011). *Design Thinking*. London: Bloomsbury Publishing Plc.

Cross, N., Christiaans, H., & Dorst, K. (1996). Introduction: The Delft Protocols Workshop. In N. Cross, H. Christiaans, & K. Dorst (Eds.), *Analysing Design Activity* (pp. 1–16). Hoboken, New Jersey: John Wiley & Sons Ltd.

Cross, N., & Clayburn Cross, A. (1995). Observations of Teamwork and Social Processes in Design. *Design Studies, 16*(2), 143–170.

Csikszentmihalyi, M. (2014). Toward a psychology of optimal experience. In *Flow and the foundations of positive psychology* (pp. 209–226). Dordrecht: Springer.

Czarniawska-Joerges, B. (2007). *Shadowing: and other techniques for doing fieldwork in modern societies*. Herndon, VA: Copenhagen Business School Press DK.

Darke, J. (1979). The Primary Generator and the Design Process. *Design Studies, 1*(1), 36–44.

Design Council. (2015a). *The Design Economy: The value of design to the UK*. London, UK: Design Council.

Design Council. (2015b). The Design Process: What is the Double Diamond? Accessed. Retrieved from https://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

Desmet, P., & Hekkert, P. (2007). Framework of Product Experience. *International Journal of Design, 1*(1), 57–66.

Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies, 32*(1), 521–532.

Dorst, K. (2015). *Frame Innovation: Create New Thinking By Design*. Cambridge, MA: The MIT Press.

Dorst, K., & Cross, N. (2001). Creativity in the design process: co-evolution of problem–solution. *Design Studies, 22*(5), 425–437.

Dourish, P. (2006). *Implications for Design.* In *Proceedings of the SIGCHI conference on Human Factors in computing systems, CHI'06, Montreal, Canada* (pp. 541–550), ACM.

Dourish, P. (2017). *The stuff of bits: an essay on the materialities of information*. Cambridge, Massachusetts: The MIT Press.

Du Gay, P., Hall, S., Janes, L., Mackay, H., & Negus, K. (1997). *Doing Cultural Studies: The Story of the Sony Walkman*. Milton Keynes: The Open University.

Dubberly, H. (2004). How do you design? A Compendium of Models. Accessed April 2, 2019. Retrieved from http://www.dubberly.com/wp-content/uploads/2008/06/ddo_designprocess.pdf

Dunne, D., & Martin, R. L. (2006). Design Thinking and How It Will Change Management Education: An Interview and Discussion. *Academy of Management Learning & Education, 5*(4), 512–523.

Fallman, D. (2003). *Design-oriented Human—Computer Interaction.* In *Proceedings of the SIGCHI conference on Human factors in computing systems, CHI 2003* (pp. 225–232), ACM.

Fallman, D. (2007). Why Research-Oriented Design Isn't Design-Oriented Research: On the Tensions Between Design and Research in an Implicit Design Discipline. *Knowledge, Technology & Policy, 20*(3), 193–200.

Findeli, A. (2001). Rethinking Design Education for the 21st Century: Theoretical, Methodological, and Ethical Discussion. *Design Issues, 17*(1), 5–17.

Fisher, T. (1997). The Designer's Self-Identity - Myths of Creativity and the Management of Teams. *Creativity and Information Management, 6*(1), 10–18.

Fisher, T. (2004). What We Touch, Touches Us: Materials, Affects, and Affordances. *Design Issues, 20*(4), 20–31.

Flowers, E. (2012). UX is not UI | Experience Design at Hello Erik. Accessed August 3rd, 2016. Retrieved from http://www.helloerik.com/ux-is-not-ui

Fox, D., Sillito, J., & Maurer, F. (2008). *Agile Methods and User-Centered Design: How These Two Methodologies are Being Successfully Integrated in Industry.* In *Proceedings of the Agile 2008 Conference* (pp. 63–72).

Friedman, K. (2012). Models of design: Envisioning a future design education. *Visible language, 46*(1/2), 133–153.

Fuchsberger, V., Murer, M., & Tscheligi, M. (2013). *Materials, Materiality, and Media.* In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2013* (pp. 2853–2862), ACM.

Garrett, J. J. (2011). *The Elements of User Experience: User-Centered Design for the Web and Beyond* (2nd. ed.). Berkeley, CA: New Riders.

Gedenryd, H. (1998). *How designers work - making sense of authentic cognitive activities.* (Ph.D. Thesis), University of Lund, Sweden.

Gericke, K., & Blessing, K. (2012). *An Analysis of Design Process Models Across Disciplines.* In *Proceedings of the International Design Conference*.

Gherardi, S. (2006). *Organizational knowledge: The texture of workplace learning*. Oxford: Blackwell Publishing.

Gherardi, S. (2010). Telemedicine: A practice-based approach to technology. *human relations, 63*(4), 501–524.

Gherardi, S. (2012). *How to conduct a practice-based study: Problems and Methods*. Northampton, Massachusetts: Edward Elgar Publishing Limited.

Gherardi, S. (2017). Sociomateriality in posthuman practice theory. In A. Hui, T. Schatzki, & E. Shove (Eds.), *The Nexus of Practices: Connections, constellations, practitioners* (pp. 38–51). New York: Routledge.

Gibson, J. J. (2015). *The Ecological Approach to Visual Perception: Classic Edition*. New York: Psychology Press.

Gobo, G. (2008). *Doing Ethnography*. London: SAGE.

Goldschmidt, G., & Rodgers, P. A. (2013). The design thinking approaches of three different groups of designers based on self-reports. *Design Studies, 34*(4), 454–471.

Goodman, E., Kuniavsky, M., & Moed, A. (2012). *Observing the User Experience: A Practitioner's Guide to User Research* (2nd ed.). London: Elsevier.

Goodwin, K. (2009). *Designing for the digital age : how to create human-centered products and services*. Indianapolis, IN: Wiley Pub.

Google Venture. GV Design Sprint. Accessed May 29th, 2016. Retrieved from http://www.gv.com/sprint/

Gothelf, J., & Seiden, J. (2013). *Lean UX: Applying Lean Principles to Improve User Experience*. Sebastopol, CA: O'Reilly Media, Inc.

Gram-Hanssen, K. (2009). Standby Consumption in Households Analyzed With a Practice Theory Approach. *Journal of Industrial Ecology, 14*(1), 150–165.

Gram-Hanssen, K. (2011). Understanding change and continuity in residential energy consumption. *Journal of Consumer Culture*, 61–78.

Greenberg, S., Carpendale, S., Marquardt, N., & Buxton, W. (2012). *Sketching User Experiences: The Workbook*. London: Elsevier.

Gunther, R. (2012). An open letter to the User Experience community. Accessed 2nd August 2016, 2016. Retrieved from http://www.ovostudios.com/uxpa/uxpa.html

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies, 14*(3), 575–599.

Haraway, D. (1991). A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late twentieth Century. In *Simians, Cyborgs, and Women: The Reinvention of Nature* (pp. 149–181). London: Free Association Books.

Hargadon, A. (1996). Brainstorming Groups in Context: Effectiveness in a Product Design Firm. *Administrative Science Quarterly, 41*(4), 685–718.

Harman, K. (2014). The multiple reals of workplace learning. *European Journal for Research on the Education and Learning of Adults, 5*(1), 51–66.

Harman, K. (2016). Examining work-education intersections: the production of learning reals in and through practice. *European Journal for Research on the Education and Learning of Adults, 7*(1), 89–106.

Harman, K., & Bohemia, E. (2007). *Another way of thinking: Creativity and Conformity*. Paper presented at the Creativity or Conformity? Building Cultures of Creativity in Higher Education, Cardiff.

Hassenzahl, M. (2004). The Thing and I: Understanding the Relationship Between User and Product. In M. A. Blythe, K. Overbeeke, A. F. Monk, & P. C. Wright (Eds.), *Funology: From Usability to Enjoyment* (Vol. 3, pp. 31–42). Dortrecht, The Netherlands: Kluwer.

Hassenzahl, M. (2010). *Experience design: Technology for all the right reasons* (J. M. Carroll Ed.). San Rafael, CA: Morgan and Claypool Publishers.

Hassenzahl, M. (2013). User Experience and Experience Design. In M. Soegaard & R. F. Dam (Eds.), *The Encyclopedia of Human-Computer Interaction* (2nd ed.). Aarhus, Denmark: The Interaction Design Foundation.

Hassenzahl, M., Diefenbach, S., & Göritz, A. (2010). Needs, affect, and interactive products – Facets of user experience. *Interacting with Computers, 22*(5), 353–362.

Hassenzahl, M., & Tractinsky, N. (2006). User experience - a research agenda. *Behaviour & Information Technology, 25*(2), 91–97.

Hassi, L., & Laakso, M. (2011). *Conceptions of Design Thinking in the Design and Management Discourses.* In *Proceedings of the IASDR2011, the 4th World Conference on Design Research*.

Hasso Plattner Institute of Design at Stanford University. (2018). A Virtual Crash Course in Design Thinking. Accessed Dec 14, 2018. Retrieved from https://dschool.stanford.edu/resources/a-virtual-crash-course-in-design-thinking

Higginson, S., Hargreaves, T., Mckenna, E., Chilvers, J., & Thomson, M. (2016). *Diagramming Commuting Practices: The connections within and between practices and their relevance for the shifting of energy demand in time*.

Howard, T. J., Culley, S. J., & Dekoninck, E. (2008). Describing the creative design process by the integration of engineering design and cognitive psychology literature. *Design Studies, 29*, 160–180.

IDEO U. (2019). Design Thinking: A Method for Creative Problem Solving. Accessed Feb 11, 2019. Retrieved from https://www.ideou.com/pages/design-thinking

Ingold, T. (2010). Bringing things to life: Creative entanglements in a world of materials. *World, 44*, 1–25.

Ingram, J., Shove, E., & Watson, M. (2007). Products and Practices: Selected Concepts from Science and Technology Studies and from Social Theories of Consumption and Practice. *Design Issues, 23*(2), 3–16.

Intercom Inc. (2016). *Intercom on Jobs-to-be-done.* Retrieved from https://www.intercom.com/books/jobs-to-be-done

International Organization for Standardization. (2010). Ergonomics of human-system interaction: Part 210: Human-centred design for interactive systems. ISO, 2010.

IxDA. (2017). About & History – Interaction Design Association – IxDA. Accessed Oct 25, 2017. Retrieved from https://ixda.org/ixda-global/about-history/

Jacucci, G., & Wagner, I. (2007). *Performative Roles of Materiality for Collective Creativity.* In *Proceedings of the C&C 07*.

Jones, J. C. (1963). A Method of Systematic Design. In N. Cross (Ed.), *Conference on design methods* (pp. 9–31). Oxford: Pergamon Press.

Jones, J. C. (1992). *Design Methods* (2nd ed.). London: David Fulton Publishers.

Julier, G. (2000). *The Culture of Design*. London: SAGE Publications.

Julier, G. (2006). From Visual Culture to Design Culture. *Design Issues, 22*(1), 64–76.

Julier, G. (2007). Design Practice within a Theory of Practice. *Design Principles and Practices, 1*(2), 43–50.

Kahneman, D. (2012). *Thinking, fast and slow*. London: Penguin.

Kamler, B., & Thomson, P. (2014). *Helping doctoral students write* (2 ed.). New York: Routledge.

Kelley, T., & Littman, J. (2001). *The Art of Innovation*. Redfern, New South Wales: Currency.

Kimbell, L. (2011). Rethinking Design Thinking: Part I. *Design and Culture, 3*(3), 285–306.

Kimbell, L. (2012). Rethinking Design Thinking: Part II. *Design and Culture, 4*(2), 129–148.

Knapp, J., Zeratsky, J., & Kowitz, B. (2016). *Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days*. New York: Simon and Schuster.

Knorr-Cetina, K. D. (1981). *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Oxford: Pergamon.
Knorr-Cetina, K. D. (1999). *Epistemic Cultures: How the sciences make knowledge*. London: Harvard University Press.
Kolko, J. (2010a). Abductive Thinking and Sensemaking: The Drivers of Design Synthesis. *Design Issues, 26*(1), 15–28.
Kolko, J. (2010b). On Academic Knowledge Production. *Interactions, 17*(5), 80–80.
Kolko, J. (2011). *Exposing the Magic of Design*. New York: Oxford University Press.
Kolko, J. (2014). *Well-designed: how to use empathy to create products people love*. Boston, Massachusetts: Harvard Business Review Press.
Krämer, H. (2017). Creativity at Work: Methodological Challenges for a Praxeological Research Program. In M. Jonas, B. Littig, & A. Wroblewski (Eds.), *Methodological reflections on practice oriented theories*. Cham, Switzerland: Springer.
Krippendorff, K. (1989). On the essential contexts of artifacts. *Design Issues, 5*(2), 9–39.
Krug, S. (2005). *Don't make me think. A common sense approach to web usability* (2nd ed.). Berkeley, California: New Riders.
Kuijer, L. (2014). *Implications of Social Practice Theory for Sustainable Design.* (Ph.D. Thesis), Technische Universiteit Delft.
Kuniavsky, M. (2007). User Experience and HCI. In *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (2 ed., pp. 897–915). New York: Lawrence Erlbaum Associates Inc.
Kuutti, K. (2009). Artifacts, Activities, and Design Knowledge. In S. Poggenpohl & K. Sato (Eds.), *Design Integrations* (pp. 67–87). Bristol: Intellect.
Kuutti, K., & Bannon, L. J. (2014). *The turn to practice in HCI: towards a research agenda.* In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI 2014* (pp. 3543–3552), ACM.
Lambe, P. (2007). *Organising Knowledge: Taxonomies, Knowledge and Organisational Effectiveness*. Oxford: Chandos Publishing.
Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, Massachusetts: Harvard University Press.
Latour, B. (1990). Technology is Society Made Durable. *The Sociological Review, 38*(S1), 103–131.
Latour, B. (1992). Where are the Missing Masses? Sociology of a Few Mundane Artifacts. In W. E. Bijker & J. Law (Eds.), *Shaping Technology/Building Society: Studies in Sociotechnical Change* (pp. 225–258). Cambridge: The MIT Press.
Latour, B. (1993). *We have never been modern*. Cambridge: Harvard University Press.
Latour, B. (2000). When things strike back: a possible contribution of 'science studies' to the social sciences. *British Journal of Sociology, 51*(1), 107–123.
Latour, B. (2004). Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern. *Critical Inquiry, 30*(2), 225–248.
Law, E., Roto, V., Hassenzahl, M., Vermeeren, A., & Kort, J. (2009). *Understanding, scoping and defining user experience: a survey approach*. Paper presented at the SIGCHI conference on human factors in computing systems, CHI 2009, Boston, MA.
Law, J. (1992). Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity. *Systems Practice, 5*(4), 379–393.

Law, J. (2004). *After Method: Mess in Social Science Research*. Oxon: Routledge.
Lawson, B. (2006). *How designers think: the design process demystified* (4th ed.). Amsterdam: Elsevier/Architectural Press.
Lawson, B., & Dorst, K. (2009). *Design expertise*. Oxford: Architectural Press.
Lidwell, W., Holden, K., & Butler, J. (2003). *Universal Principles of Design*. Beverly, Massachusetts: Rockport Publishers.
Liedtka, J., & Ogilvie, T. (2011). *Designing for Growth: A Design Thinking Tool Kit for Managers*. New York: Columbia University Press.
Lloyd, P., & Scott, P. (1994). Discovering the design problem. *Design Studies, 15*(2), 125–140.
Lloyd, P., & Snelders, D. (2003). What was Philippe Starck thinking of? *Design Studies, 24*(3), 237–253.
Lupton, D. (2017). How does health feel? Towards research on the affective atmospheres of digital health. *Digital Health, 3*, 1–11.
Maeda, J. (2006). *The Laws of Simplicity: Design, Technology, Business, Life*. Cambridge, Massachusetts: The MIT Press.
Maguire, M. (2001). Methods to support human-centred design. *International Journal of Human-Computer Studies, 55*(4), 587–634.
Mahnič, V., & Hovelja, T. (2012). On using planning poker for estimating user stories. *The Journal of Systems and Software, 85*, 2086–2095.
Mareis, C. (2011). *Design als Wissenskultur: Interferenzen zwischen Design- und Wissensdiskursen seit 1960*. Bielefeld: transcript Verlag.
Margolin, V. (1995). The Politics of the Artificial. *Leonardo, 28*(5), 349–356.
Margolin, V. (2007). Design, the Future and the Human Spirit. *Design Issues, 23*(3), 4–15.
Margolin, V. (2013). Design Studies: Tasks and Challenges. *The Design Journal, 16*(4), 400–407.
Martin, R. L. (2009). *The design of business: Why design thinking is the next competitive advantage*. Boston, Massachusetts: Harvard Business Press.
Mazé, R. (2016). Design and the Future: Temporal Politics of 'Making a Difference'. In R. C. Smith (Ed.), *Design anthropological futures*. London: Bloomsbury Academic.
McCarthy, J., & Wright, P. (2004a). Technology as Experience. *Interactions*(September + October), 42–43.
McCarthy, J., & Wright, P. (2004b). *Technology as experience*. London: The MIT Press.
McCarthy, J., & Wright, P. (2015). *Taking [A]part the politics and aesthetics of participation in experience-centered design*. Cambridge, Massachusetts: The MIT Press.
McFall, L. (2014). The Problem of Cultural Intermediaries in the Economy of Qualities. In *The Cultural Intermediaries Reader* (pp. 42–52).
McKay, E. N. (2013). *UI is communication: How to design intuitive, user-centered inferfaces by focusing on effective communication*. London: Morgan Kaufmann.
Miller, D. (2008). *The Comfort of Things*. Oxford: Polity.
Miller, T. (2010). Culture + Labour = Precariat. *Communication and Critical/Cultural Studies, 7*, 96–99.
Miller, T. (2014). Cultural Work and Creative Industry. In *The Cultural Intermediaries Reader* (pp. 25–34): SAGE Publications.
Mol, A. (1999). Ontological politics. A word and some questions. *The Sociological Review, 47*(1), 74–89.

Mol, A. (2002). *The body multiple: Ontology in medical practice*. Durham, NC: Duke University Press.

Mol, A. (2008). *The Logic of Care: Health and the problem of patient choice*. London: Routledge.

Molotch, H. L. (2003). *Where Stuff Comes From*. New York: Routledge.

Mueller, R., & Thoring, K. (2012). *Design Thinking vs. Lean Startup: A comparison of two user-driven innovation strategies*. Paper presented at the International Design Management Research Conference, Boston.

Murphy, M. (2015). Unsettling care: Troubling transnational itineraries of care in feminist health practices. *Social Studies of Science, 45*(5), 717–737.

Negus, K. (2002). The Work of Cultural Intermediaries and the Enduring Distance between Production and Consumption. *Cultural Studies, 16*(4), 501–515.

Neubauer, R., & Bohemia, E. (2018). *Redefining Innovation Processes: The Digital Designers at Work.* In *Proceedings of the British HCI 2018*, BCS Learning and Development Ltd.

Neubauer, R., Bohemia, E., & Harman, K. (2016). *Highlighting issues in current conceptions of user experience design through bringing together ideas from HCI and social practice theory*. Paper presented at the 6th STS Italia Conference | Sociotechnical Environments, Trento, Italy.

Nielsen Norman Group. (2018). UX Training by Nielsen Norman Group: the UX Conference, Online Seminars, In-House UX Training, and UX Certification. Accessed Dec 14, 2018. Retrieved from https://www.nngroup.com/training/

Nodder, C. (2013). *Evil by Design: Interaction Design to Lead us into Temptation*. Indianapolis, IN: John Wiley & Sons, Inc.

Norman, D. (1988). *The Design of Everyday Things*. New York: Doubleday.

Norman, D. (2004). *Emotional Design*. Cambridge, Massachusetts: Basic Books.

Norman, D. (2013). *The Design of Everyday Things: Revised and Expanded Edition*. New York: Basic Books.

O'Reilly, K. (2014). The role of the social imaginary in lifestyle migration: employing the ontology of practice theory. In M. Benson & N. Osbaldiston (Eds.), *Understanding Lifestyle Migration: Theoretical Approaches to Migration and the Quest for a Better Way of Life* (pp. 211–234). Basingstoke: Palgrove.

O'Riordan, K. (2017). *Unreal Objects: Digital Materialities, Technoscientific Projects and Political Realities*. London: PlutoPress.

Orlikowski, W. J. (2007). Sociomaterial Practices: Exploring Technology at Work. *Organization Studies, 28*(9), 1435–1448.

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2014). *Value Proposition Design: How to Create Products and Services Customers Want*. Hoboken, New Jersey: Wiley.

Oswald, D. (2010). *Towards a Redefinition of Product Design and Product Design Education*. Paper presented at the International Conference on Engineering and Product Design Education, Trondheim, Norway.

Oygür, I. (2017). The machineries of user knowledge production. *Design Studies, 54*, 23–49.

Pantzar, M., & Shove, E. (2010). Understanding innovation in practice: a discussion of the production and re-production of Nordic Walking. *Technology Analysis & Strategic Management, 22*(4), 447–461.

Papanek, V. (1985). *Design for the Real World*. London: Thames & Hudson Ltd.

Patton, J. (2014). *User story mapping: discover the whole story, build the right product*. Cambridge: O'Reilly.
Pink, S. (2009). *Doing sensory ethnography*. London: SAGE.
Pink, S., Horst, H., Postill, J., Hjorth, L., Lewis, T., & Tacchi, J. (2016). *Digital Ethnography: Principles and Practice*. London: Sage Publications.
Polaine, A., Lovlie, L., & Reason, B. (2013). *Service Design: From Insight to Implementation*. New York: Rosenfeld Media.
Portigal, S. (2013). *Interviewing Users: How to Uncover Compelling Insights*. New York: Rosenfeld Media.
Powell, J. A. (1987). Is architectural design a trivial pursuit? *Design Studies, 8*(4), 187–206.
Puig de la Bellacasa, M. (2011). Matters of care in technoscience: Assembling neglected things. *Social Studies of Science, 41*(1), 85–106.
Reckwitz, A. (2002). Toward a Theory of Social Practices A Development in Cultural Theorizing. *European Journal of Social Theory, 5*(2), 243–263.
Redström, J. (2006). Towards user design? On the shift from object to user as the subject of design. *Design Studies, 27*(1), 123–139.
Ries, E. (2011). *The Lean Startup*. London: Portfolio Penguin.
Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences, 4*(1), 155–169.
Rosenfeld, L., & Morville, P. (2002). *Information architecture for the World Wide Web* (2nd ed.. ed.). Sebastopol, CA: O'Reilly.
Rosenfeld Media. (2018). Corporate Training by Rosenfeld Media. Accessed Dec 14, 2018. Retrieved from https://rosenfeldmedia.com/training/
Rosner, D. K. (2012). *The Material Practices of Collaboration.* In *Proceedings of the ACM 2012 conference on computer supported cooperative work* (pp. 1155–1164), ACM.
Scapin, D. L., Senach, B., Trousse, B., & Pallot, M. (2012). *User Experience: Buzzword or New Paradigm?* In *Proceedings of the ACHI 2012, The Fifth International Conference on Advances in Computer-Human Interactions*, IARIA.
Schatzki, T. R. (1996). *Social Practices: A Wittgensteinian Approach to Human Activity and the Social.* Cambridge: Cambridge University Press.
Schatzki, T. R. (2002). *The site of the social: A philosophical exploration of the constitution of social life and change.* Pennsylvania: Penn State Press.
Schatzki, T. R. (2010). *The timespace of human activity on performance, society, and history as indeterminate teleological events*. Lanham: Lexington Books.
Schatzki, T. R., Knorr Cetina, K., & Von Savigny, E. (2001). *The Practice Turn in Contemporary Theory*. London: Routledge.
Schifferstein, H. N., & Hekkert, P. (Eds.). (2011). *Product Experience*. Amsterdam: Elsevier.
Schön, D. A. (1983). *The reflective practitioner how professionals think in action*. New York: Basic Books.
Shove, E. (2010). Beyond the ABC: Climate Change Policy and Theories of Social Change. *Environment and Planning A, 42*(6), 1273–1285.
Shove, E., & Pantzar, M. (2005). Consumers, Producers and Practices: Understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture, 5*(1), 43–64.

Shove, E., Pantzar, M., & Watson, M. (2012). *The Dynamics of Social Practices: Everyday life and how it changes*. London: SAGE.
Shove, E., Watson, M., Hand, M., & Ingram, J. (2007). *The Design of Everyday Life*. Oxford: Berg.
Simon, H. A. (1996). *The Sciences of the Artificial* (3rd ed.). London: The MIT Press.
Singleton, W. T. (1974). *Man-Machine Systems*. England: Penguin Education.
Stewart, S. C. (2011). Interpreting Design Thinking, Editorial. *Design Studies, 32*(6), 515–520.
Stickdorn, M., Schneider, J., Andrews, K., Belmonte, B., Beuker, R., Bisset , F., . . . Segelström, F. (2011). *This is Service Design Thinking: Basics - Tools - Cases*. Hoboken, NJ: Wiley.
Stolterman, E. (2008). The Nature of Design Practice and Implications for Interaction Design Research. *International Journal of Design, 2*(1), 55–65.
Suchman, L. (1994). Working Relations of Technology Production and Use. *Computer Supported Cooperative Work (CSCW), 2*, 21–39.
Suchman, L. (2002a). Located accountabilities in technology production. *Scandinavian Journal of Information Systems, 14*(2), 91–105.
Suchman, L. (2002b). Practice-Based Design of Information Systems: Notes from the Hyperdeveloped World. *The Information Society, 18*(2), 139–144.
Suchman, L. (2007). *Human-Machine Reconfigurations: Plans and Situated Actions*. New York: Cambridge University Press.
Sunley, P., Pinch, S., & Reimer, S. (2011). Design capital: practice and situated learning in London design agencies. *Transactions of the Institute of British Geographers, 36*, 377–392.
Taylor, A. (2015). After Interaction. *Interactions, 22*(5), 48–53.
Telier, A. (2012). Drawing Things Together. *Interactions, 19*(2), 34–37.
Telier, A., Binder, T., De Michelis, G., Ehn, P., Jacucci, G., Linde, P., & Wagner, I. (2011). *Design Things*. Cambridge, Massachusetts: The MIT Press.
Tholander, J., Normark, M., & Rossitto, C. (2012). *Understanding Agency in Interaction Design Materials.* In *Proceedings of the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM.
Tonkinwise, C. (2011). A taste for practices: Unrepressing style in design thinking. *Design Studies, 32*(6), 533–545.
Unger, R., & Chandler, C. (2009). *A Project Guide to UX Design: For User Experience Designers in the Field or in the Making*. Berkeley, CA: New Riders.
UXPA. (2018). About UX | User Experience Professionals Association. Accessed April 23, 2018. Retrieved from https://uxpa.org/resources/about-ux
Velten Schäfer, E. (2015). Sport mit den Mitteln des Pop. Skateboard-Videos: Bewegungslernen, Vergemeinschaftung und Jugendmarketing/Doing Sports through the Media of Pop Culture. Motor Learning, Communitization, and Youth Market Branding in Skateboard Videos. *Sport und Gesellschaft, 12*(2), 149–170.
Verbeek, P.-P. (2015). Beyond interaction. *Interactions, 22*(3), 26–31.
Verbeek, P.-P. (2016). Toward a Theory of Technological Mediation: A Program for Postphenomenological Research. In J. K. B. O. F. Friis & R. C. Crease (Eds.), *Technoscience and Postphenomenology: The Manhattan Papers* (pp. 189–204). London: Lexington Books.
Verganti, R. (2008). Design, meanings and radical innovation: A meta-model and a research agenda. *Journal of Product Innovation Management, 25*(5), 436–456.

Verganti, R. (2009). *Design-driven innovation: Changing the rules of competition by radically innovating what things mean*. Boston, Massachusetts: Harvard Business Press.

Vines, J., Clarke, R., Wright, P., McCarthy, J., & Olivier, P. (2013). *Configuring Participation: On How We Involve People In Design*. Paper presented at the CHI 2013: Changing Perspectives, Paris, France.

Volonté, P. (2014). Design Worlds and Science and Technology Studies. *Italian Journal of Science & Technology Studies, 5*(2), 5–14.

Volonté, P. (2019). The thin ideal and the practice of fashion. *Journal of Consumer Culture, 19*(2), 1–19.

von Hippel, E. (1986). Lead Users: A Source of Novel Product Concepts. *Management Science, 32*(7), 791–805.

Wambach, M. (2015). Hypotheses driven UX design – theuxblog.com. Accessed May 3rd, 2019. Retrieved from https://medium.theuxblog.com/hypotheses-driven-ux-design-c75fbf3ce7cc

Warfel, T. Z. (2009). *Prototyping: A Practitioner's Guide*. New York: Rosenfeld Media.

Weinschenk, S. (2011). *100 things every designer needs to know about people: What makes them tick?* Berkeley, CA: New Riders.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity*. New York: Cambridge Press.

Wenger, E. (2000). Communities of Practice and Social Learning Systems. *Organization, 7*(2), 225–246.

Wilkie, A. (2010). *User Assemblages in Design: An Ethnographic Study.* (Ph.D.), Goldsmiths, University of London, London.

Wilkie, A., & Michael, M. (2015). The design studio as a centre of synthesis. In I. Farías & A. Wilkie (Eds.), *Studio Studies*. London: Routledge.

Woolgar, S. (1991). Configuring the user: the case of usability trials. In J. Law (Ed.), *A sociology of monsters: essays on power, technology and domination* (pp. 58–100). London: Routledge.

Wright, P., Blythe, M. A., & McCarthy, J. (2006). User Experience and the Idea of Design in HCI. In S. W. Gilroy & M. D. Harrison (Eds.), *International Workshop on Design, Specification, and Verification of Interactive Systems* (pp. 1–14). Berlin: Springer.

Wright, P., McCarthy, J., & Meekison, L. (2003). Making sense of experience. In M. A. Blythe, K. Overbeeke, A. F. Monk, & P. Wright (Eds.), *Funology: From Usablity to Enjoyment* (pp. 43–53). Dortrecht, The Netherlands: Kluwer.

Wynn, D., & Clarkson, J. (2005). Models of designing. In J. Clarkson & C. Eckert (Eds.), *Design process improvement* (pp. 34–59). London: Springer.

Wynn, D., & Clarkson, J. (2018). Process models in design and development. *Research in Engineering Design, 29*(2), 161–120.

Yaneva, A. (2009). *Made by the office for Metropolitan Architecture: An Ethnography of Design*. Rotterdam: 010 Publishers.

Young, I. (2008). *Mental models: Aligning strategy with human behavior*. New York: Rosenfeld Media.

Young, I. (2015). *Practical empathy for collaboration and creativity in your work*. New York: Rosenfeld Media.

Youngs, G. (2014). *Designing the Digital Economy: Embedding Growth through Design, Innovation and Technology*. Design Commission.